Infant Mortality in the US: Where We Stand




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U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

A Tale of Two Babies

1963

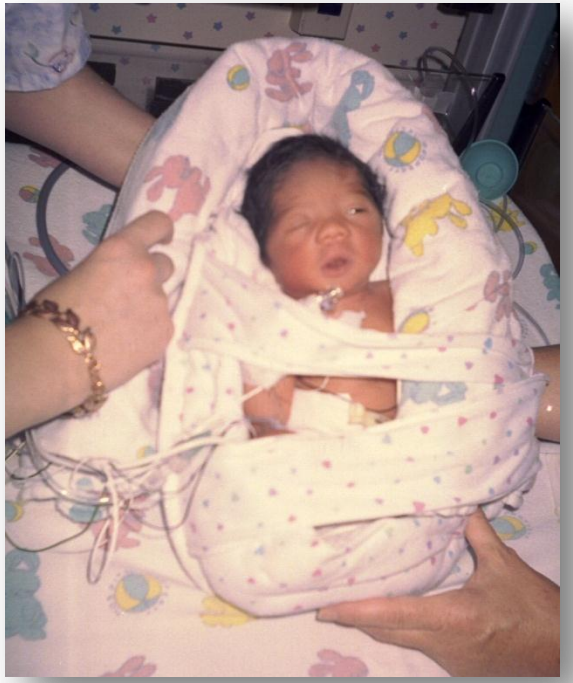
The New York Times.

2d Son Born to Kennedys; Has Lung Illness

KENNEDY TO SEND TEST BAN TREATY TO SENATE TODAY

Figure 1-4. Front page of *The New York Times*, August 8, 1963. (Copyright © 1963 by *The New York Times Co.* Reprinted by permission.)

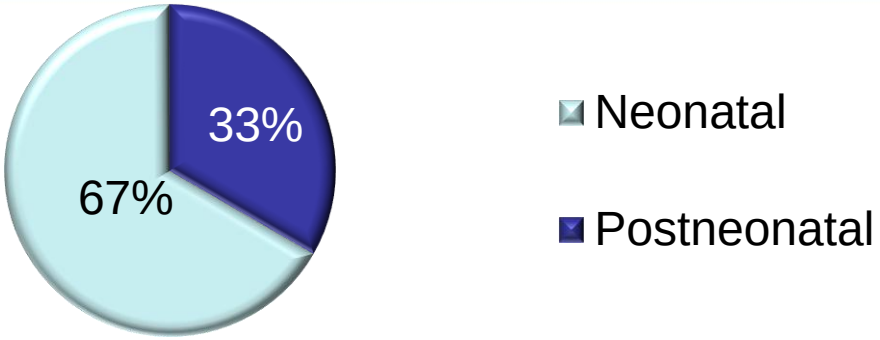
2001



What is Infant Mortality?

- **The death of a live-born infant before his/her first birthday**
  - Neonatal period: 0 - 27 days
  - Postneonatal period: 28 - 364 days
- **The largest component of childhood mortality**
- **A major indicator of societal health and well-being**

Timing of U.S. Infant Death, 2011



Neonatal (<28 days)

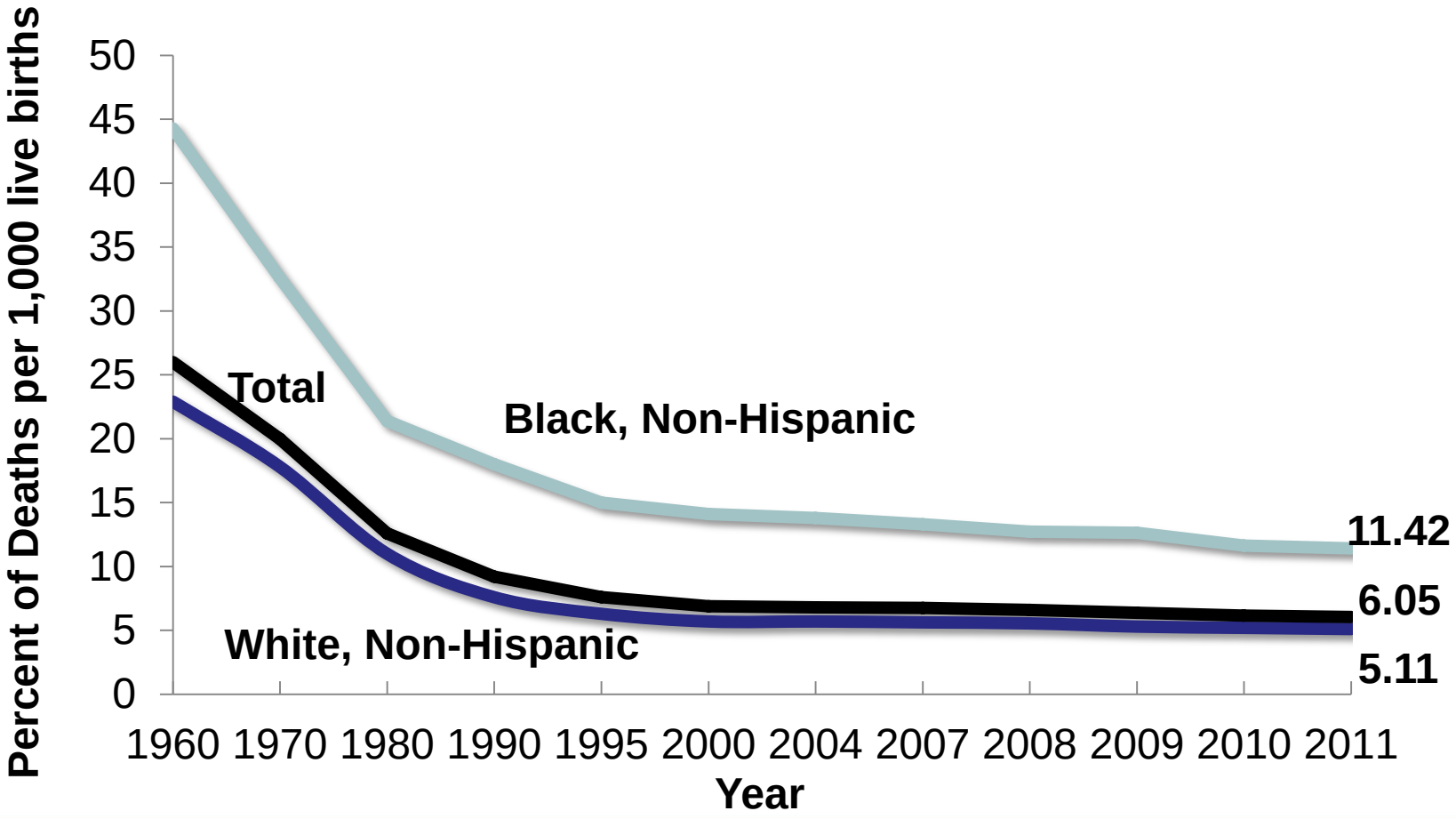
- **Drivers**:
  - Preterm
  - Birth defects
  - Maternal health conditions
  - Lack of access to risk-appropriate care

Postneonatal (28-364 days)

- **Drivers:**
  - Sudden unexpected infant death (SUID)/Sudden infant death syndrome (SIDS)
  - Injury
  - Infection

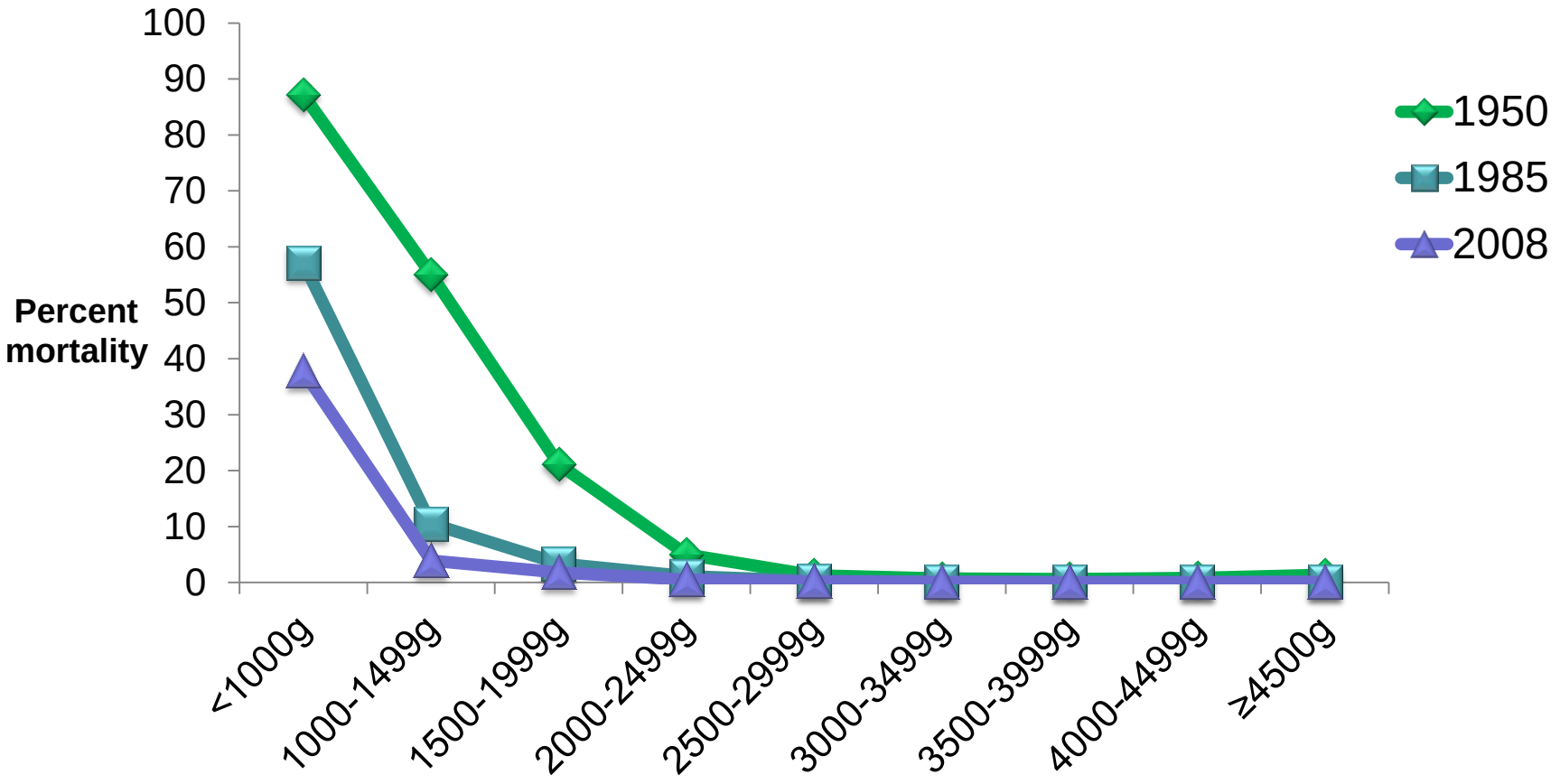
National Center for Health Statistics, National Vital Statistics Reports, 2011

U.S. Infant Mortality Rates, 1960-2011

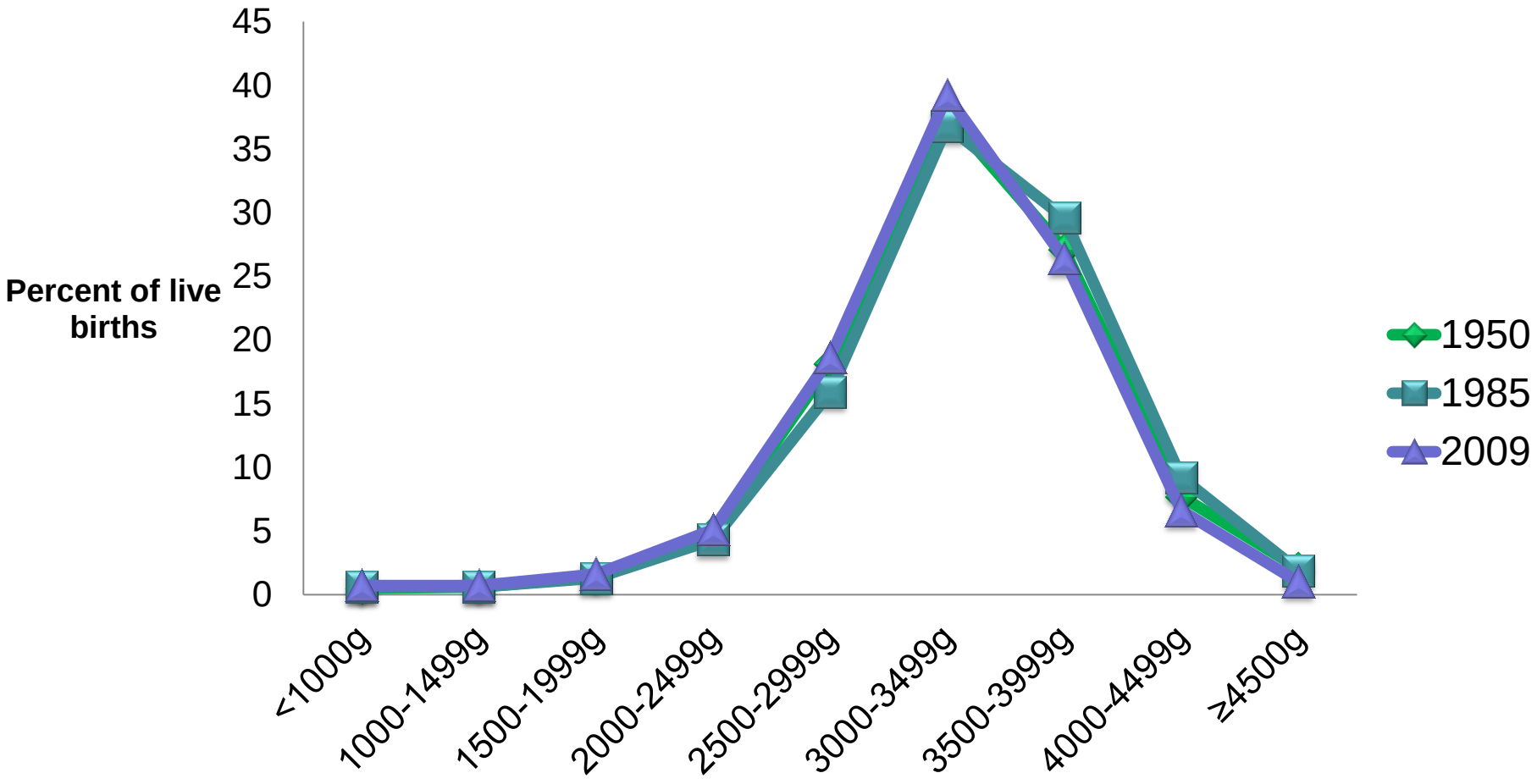


National Center for Health Statistics, National Vital Statistics Reports

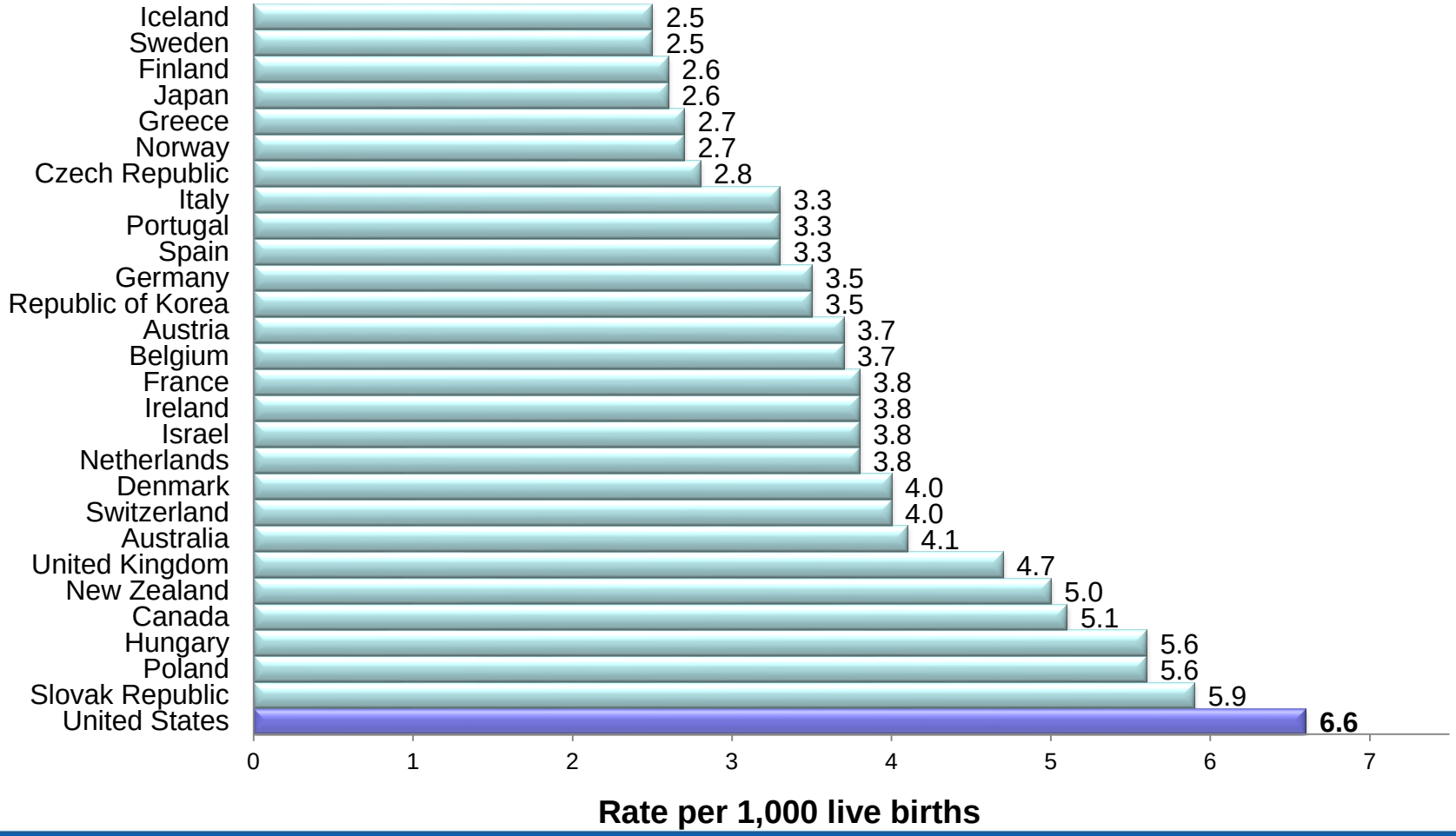
Trends: Birth Weight-Specific Neonatal Mortality



Trends: Birth Weight Distribution



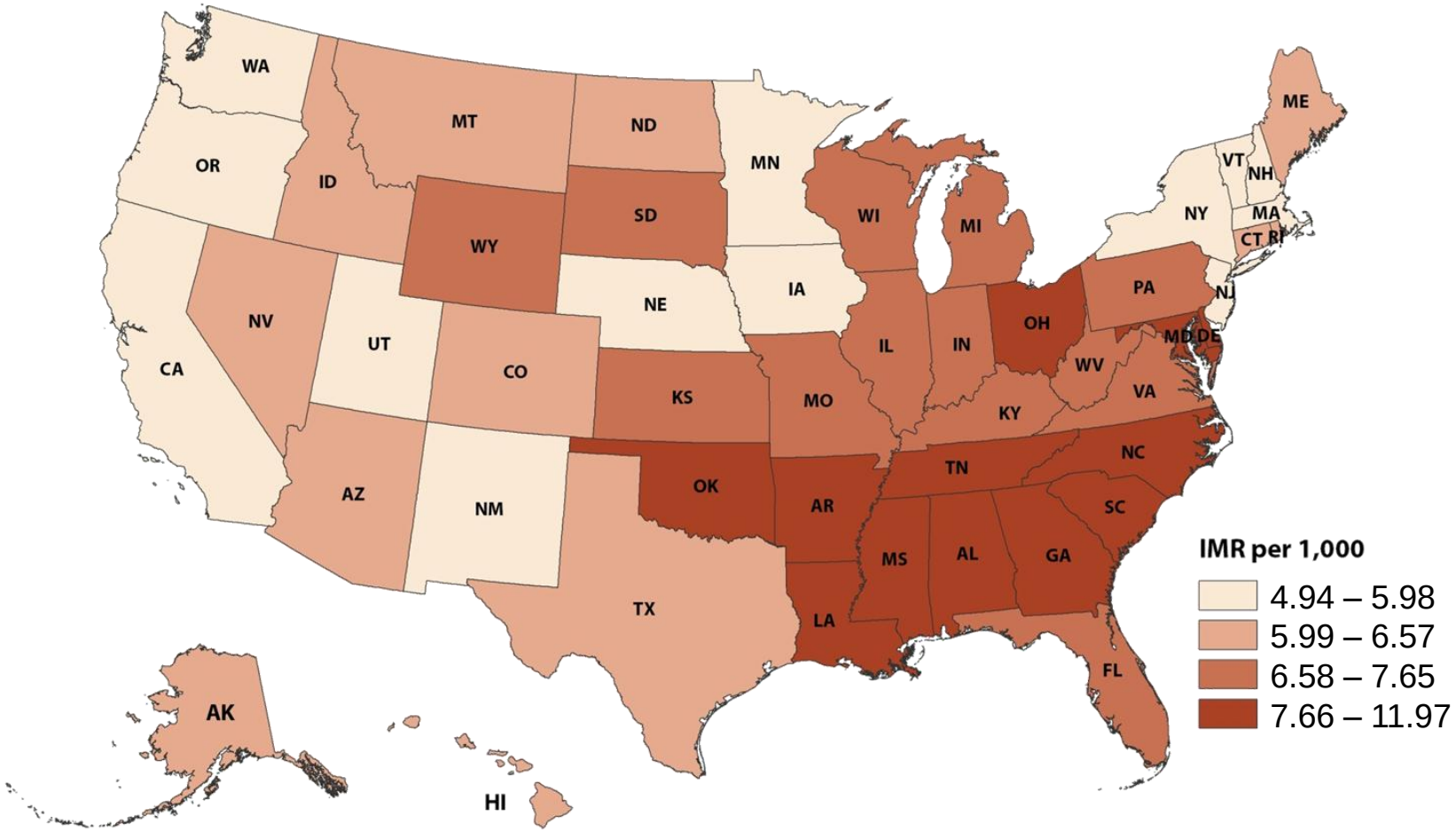
Infant Mortality Rates, OECD Countries, 2008



Health, United States, 2011

OECD: Organization for Economic Cooperation and Development

Infant Mortality Rate, 2006-2008



National Center for Health Statistics

Underlying Causes of Infant Death in the US, 2008

NEONATAL			
	Cause of death	***Percentage of total deaths (in specified group)***	***Mortality rate (per 100,000 live births in specified group)***
	Disorders related to short gestation and low birth weight, not elsewhere classified	25.4%	109.0
	Congenital malformations, deformations and chromosomal anomalies	21.7%	93.1
	Maternal complications of pregnancy	9.6%	41.0
	Complications of placenta, cord and membranes	5.9%	25.1
	Bacterial sepsis	3.7%	15.9

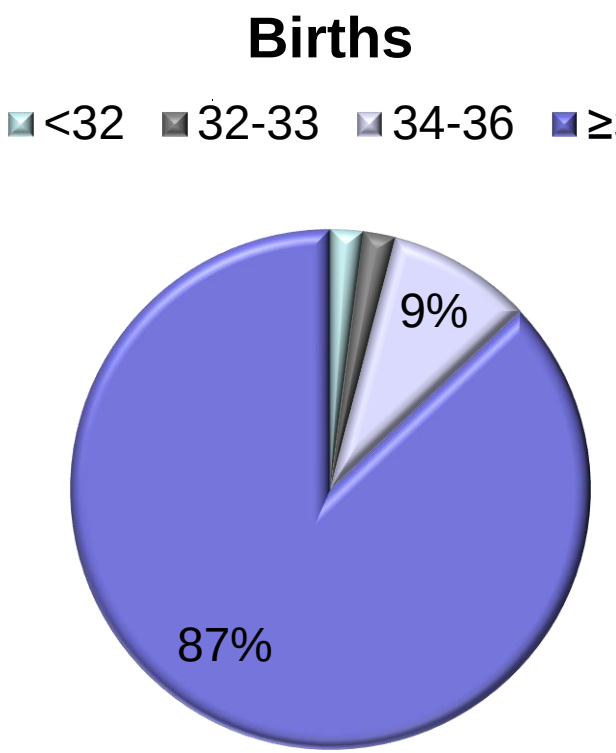
POSTNEONATAL			
	Cause of death	***Percentage of total deaths (in specified group)***	***Mortality rate (per 100,000 live births in specified group)***
	Sudden infant death syndrome	21.7%	50.4
	Congenital malformations, deformations and chromosomal anomalies	15.6%	39.6
	Unintentional injuries	12.0%	27.9
	Diseases of the circulatory system	4.9%	11.5
	Gastritis, duodenitis, and non-infective enteritis and colitis	3.4%	7.9

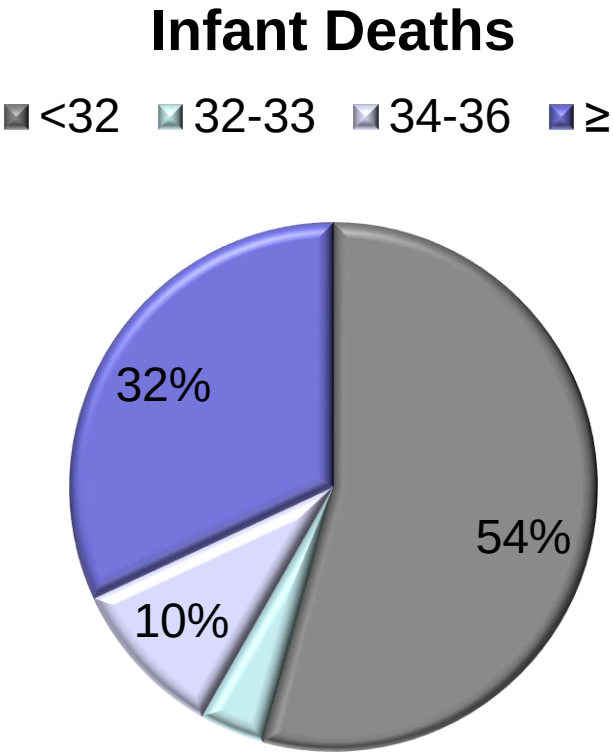
*ICD-10 codes grouped by modified Dolfus classification scheme

http://www.cdc.gov/nchs/data/nvsr/nvsr60/nvsr60_06.pdf

Contribution of Preterm Birth to U.S. Infant Mortality

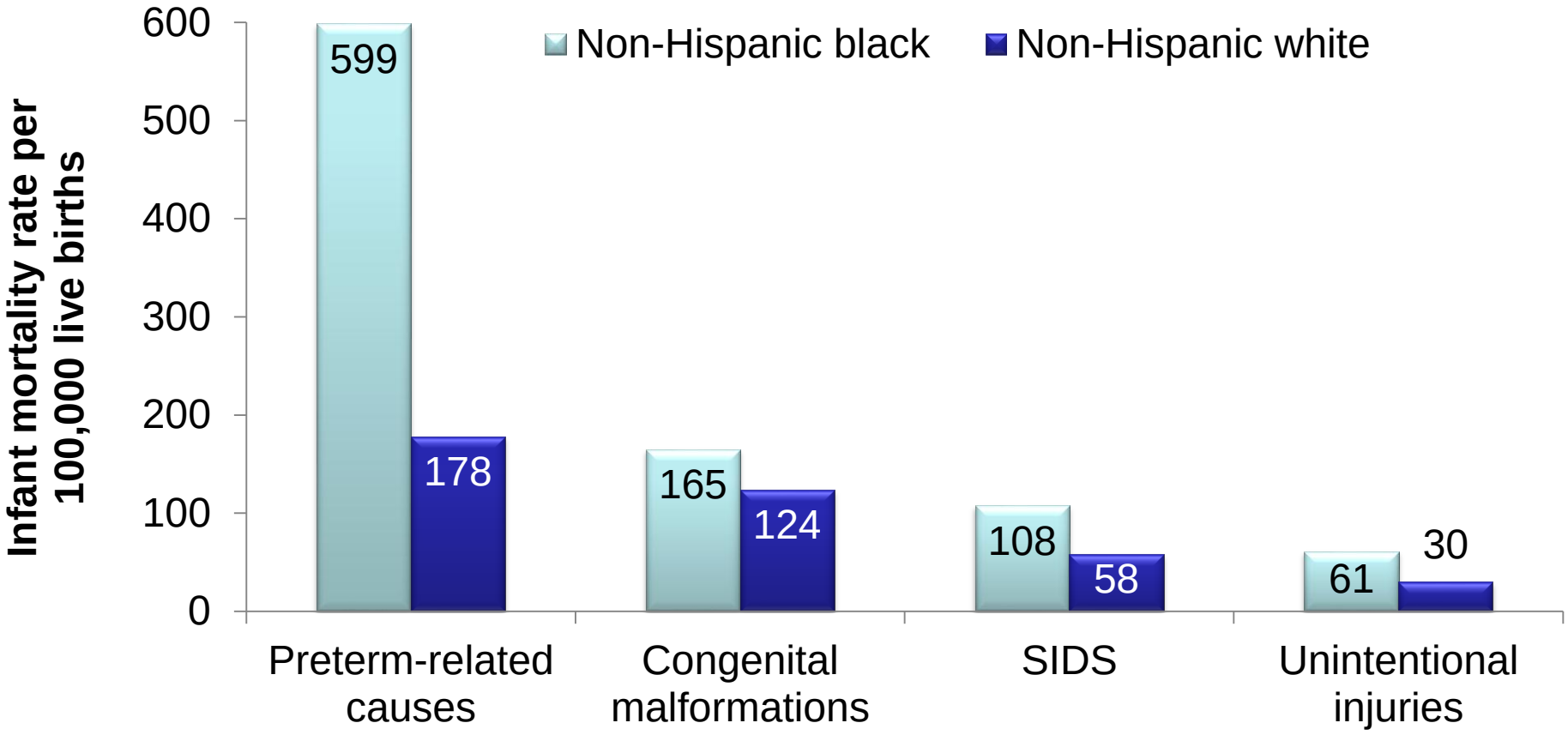
Percent of Live Births and Infant Deaths by Weeks of Gestation, US, 2007





National Center for Health Statistics, linked birth/infant death data set

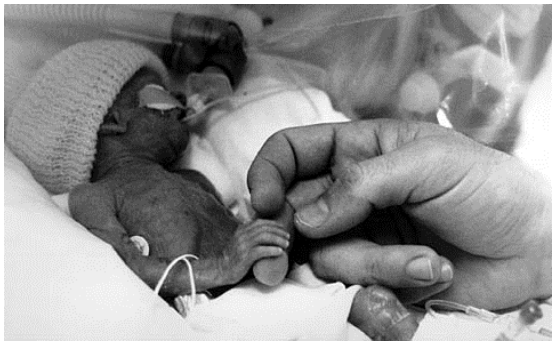
U.S. Infant Mortality Rates for Selected Causes of Death for Non-Hispanic Black and Non-Hispanic White Women



CDC/National Center for Health Statistics, linked birth/infant death data set, 2007

Contribution of Preterm Birth to the U.S. Infant Mortality Rate

- **The tiniest babies bear the biggest burden**
  - More than 50% of infant deaths occur among infants 32 weeks gestation or younger
- **Annual societal economic burden**
  - $26.2 billion (2005)
- **Major contributor to poor international rankings**
  - US ranks 130 of 184 in preterm births



Maintaining the Gains: Provision of Risk-Appropriate Care

- **Meta-analysis of 30 years of data on perinatal regionalization (104, 944 VLBW infants)**
- **Odds of death at non-level III facilities**
  - Infants weighing ≤1500g
    - OR 1.62 (95% CI 1.44 - 1.83)
  - Infants weighing ≤1000g
    - OR 1.64 (95% CI 1.14 - 2.36)
  - Infants born ≤32 weeks
    - OR 1.55 (95% CI 1.21 - 1.98)
- **In the US, many of these infants are not delivered in level III facilities**

Lasswell SM, Barfield WD, Rochat RW. Perinatal regionalization for very low-birthweight and very preterm infants: a meta-analysis. JAMA 2010 Sept 1;304(9)

VLBW: very low birthweight

Contribution of Cigarette Smoking to Infant Mortality

- **Prenatal smoking occurs in 11.5% of all U.S. live births**
- **Smoking in pregnancy accounts for**
  - 5%-8% of preterm deliveries
  - 13%-19% of low birth weight among term infants
  - 23%-34% of deaths due to SIDS
  - 5%-7% of deaths from preterm-related causes
- **Potentially preventable**

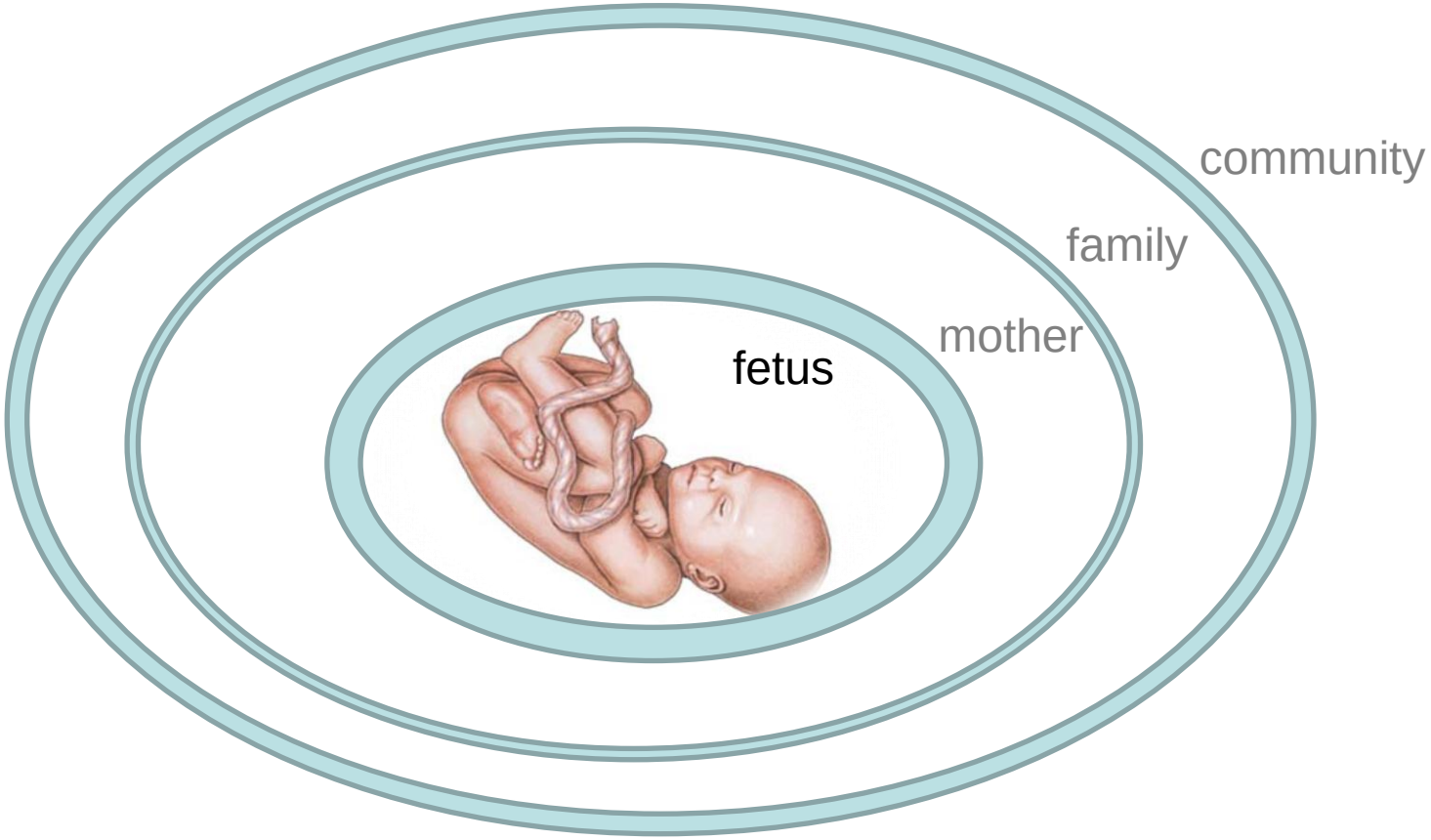
Dietz PM, England LJ, Shapiro-Mendoza CK, et al. Infant morbidity and mortality attributable to prenatal smoking in the U.S. Am J Prev Med 2010 Jul .38(1)

Five Current National Strategies for Infant Mortality Reduction

- Prevention of Elective Deliveries < 39 weeks
- SIDS/SUID Risk Reduction
- Perinatal Regionalization
- Smoking Cessation in Pregnancy
- Preconception and Interconception Care

ASTHO President's Challenge: www.astho.org
ASTHO: Association of State and Territorial Health Officials

Circle of Influences on Fetal and Infant Health



Pregnancy Risk Assessment Monitoring System (PRAMS): Using Data to Reduce Infant Deaths




Denise D'Angelo, MPH

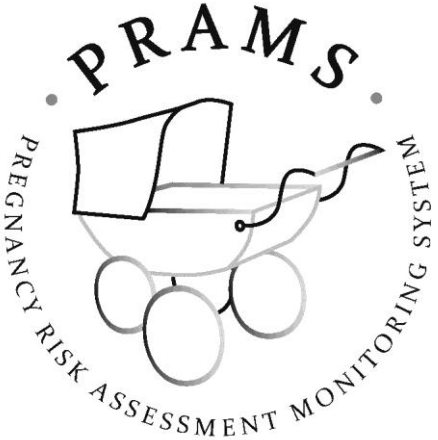
Health Scientist, Division of Reproductive Health

National Center for Chronic Disease Prevention and Health Promotion

Centers for Disease Control and Prevention

PRAMS Overview

- Population-based surveillance system
- Self-reported maternal behaviors and experiences around the time of pregnancy
- Supplements birth certificate information
- State and near-national estimates



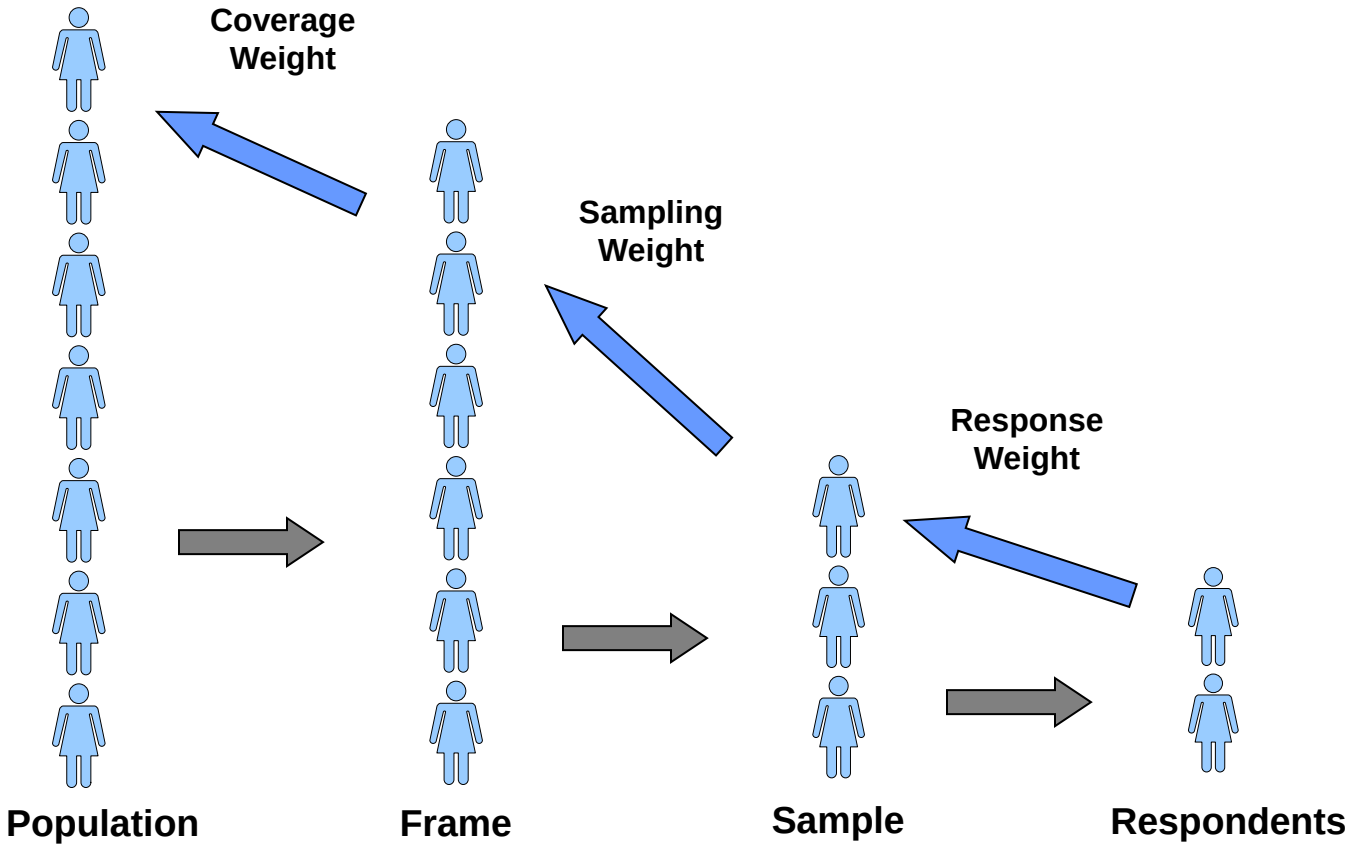
PRAMS Background and Goals

- **Established in 1987 as part of an Infant Health Initiative**
- **Congressional funding provided to CDC to establish state-based programs**
- **Reduce maternal and infant morbidity and mortality**
  - Maternal and infant health programs
  - Health policies
  - Maternal behaviors

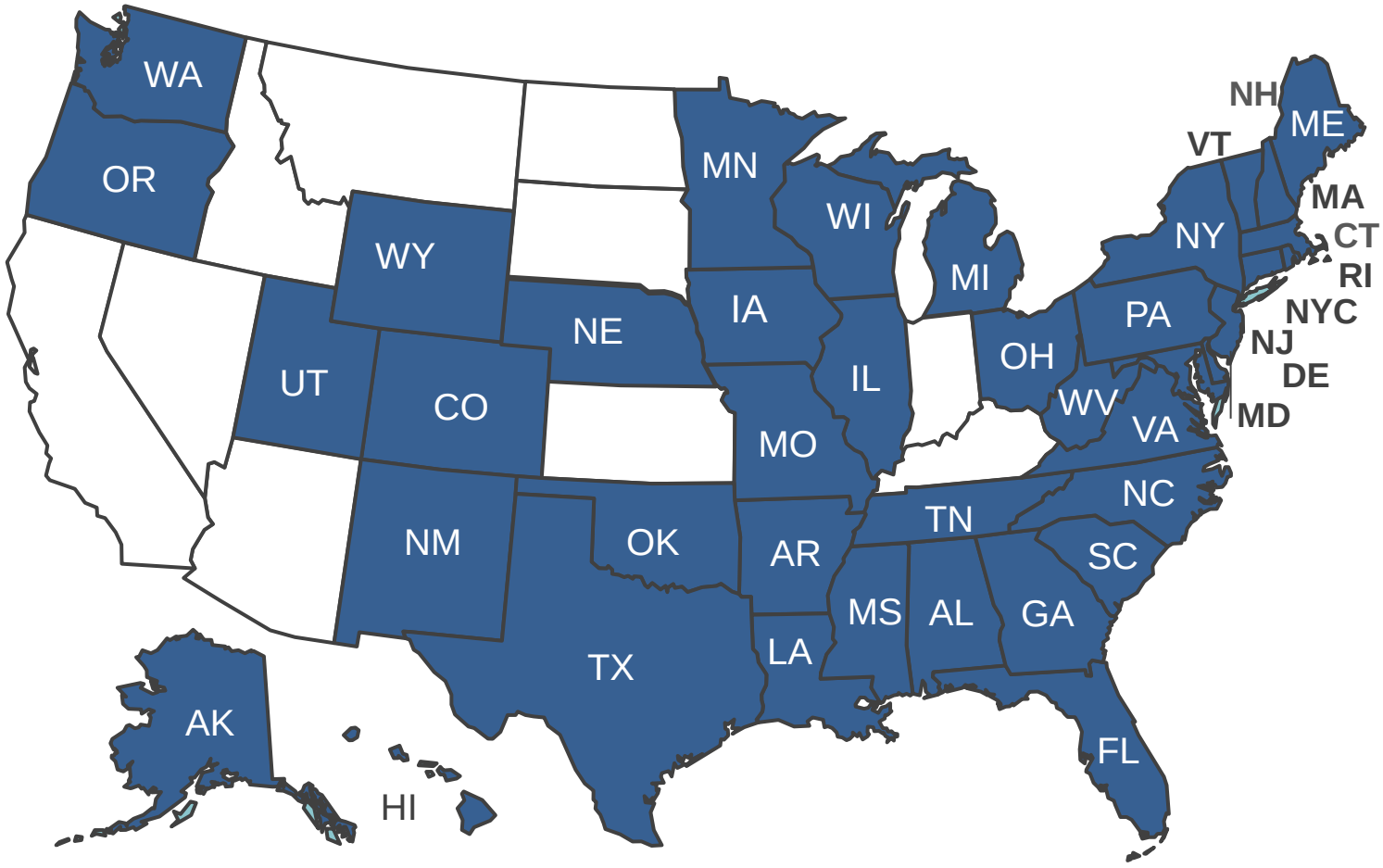
Who Participates in the PRAMS Surveys?

- **Women who recently delivered a live infant**
  - Random sample from birth certificate records
  - Women are sampled when infants are 2 - 6 months old
  - State sample ~1500–3000 women per year
  - 40 states and NYC (combined annual sample ~ 77,000)

Representative Sample



PRAMS Participation, 2012



PRAMS represents approximately 78% of all U.S. live births

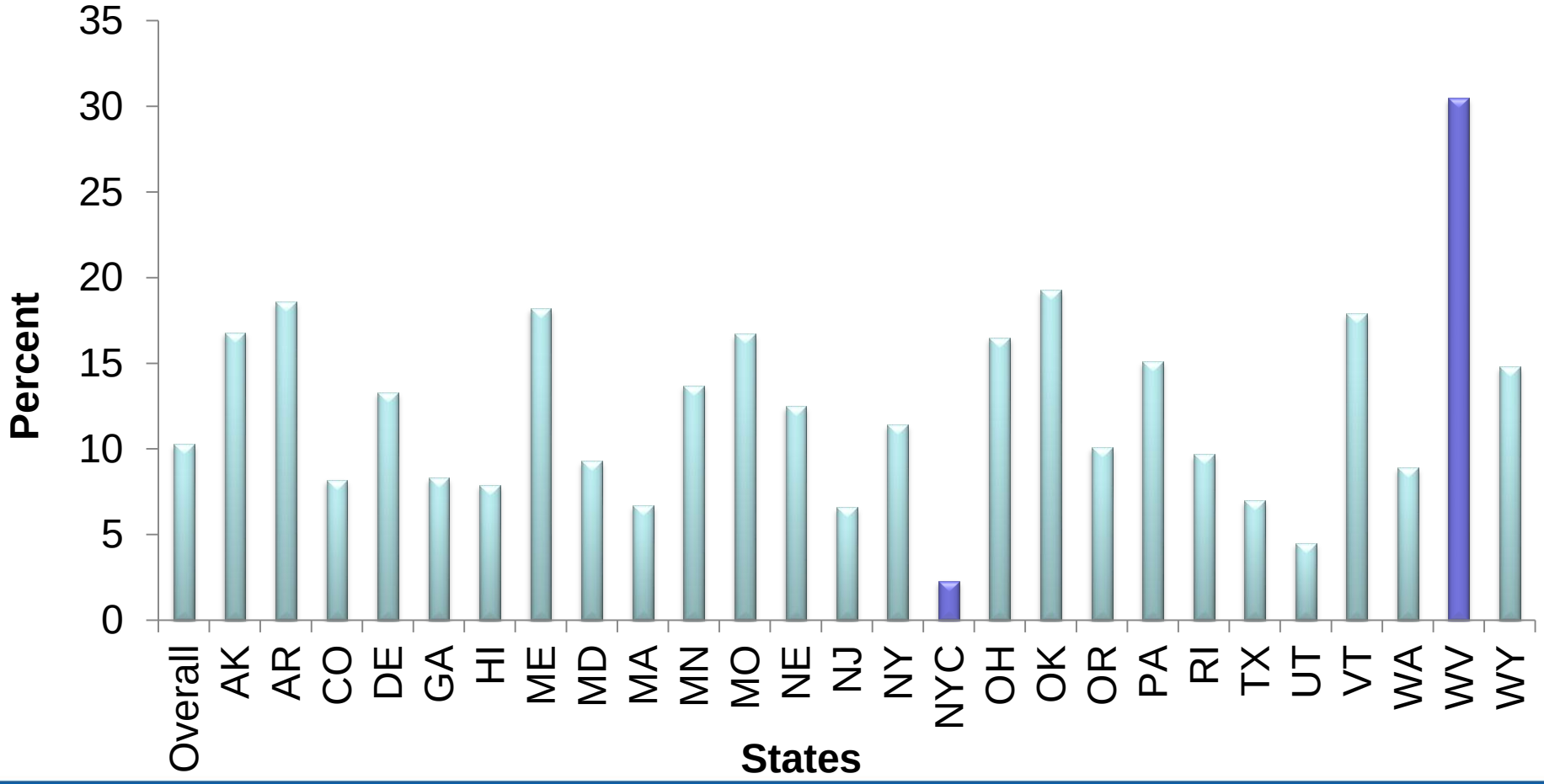
PRAMS Surveys

- Data collection primarily by mailed paper survey
- Survey booklets are 14 pages and around 85 questions in length
- Telephone follow-up
- Takes 20 - 30 minutes to complete

Selected PRAMS Survey Topics

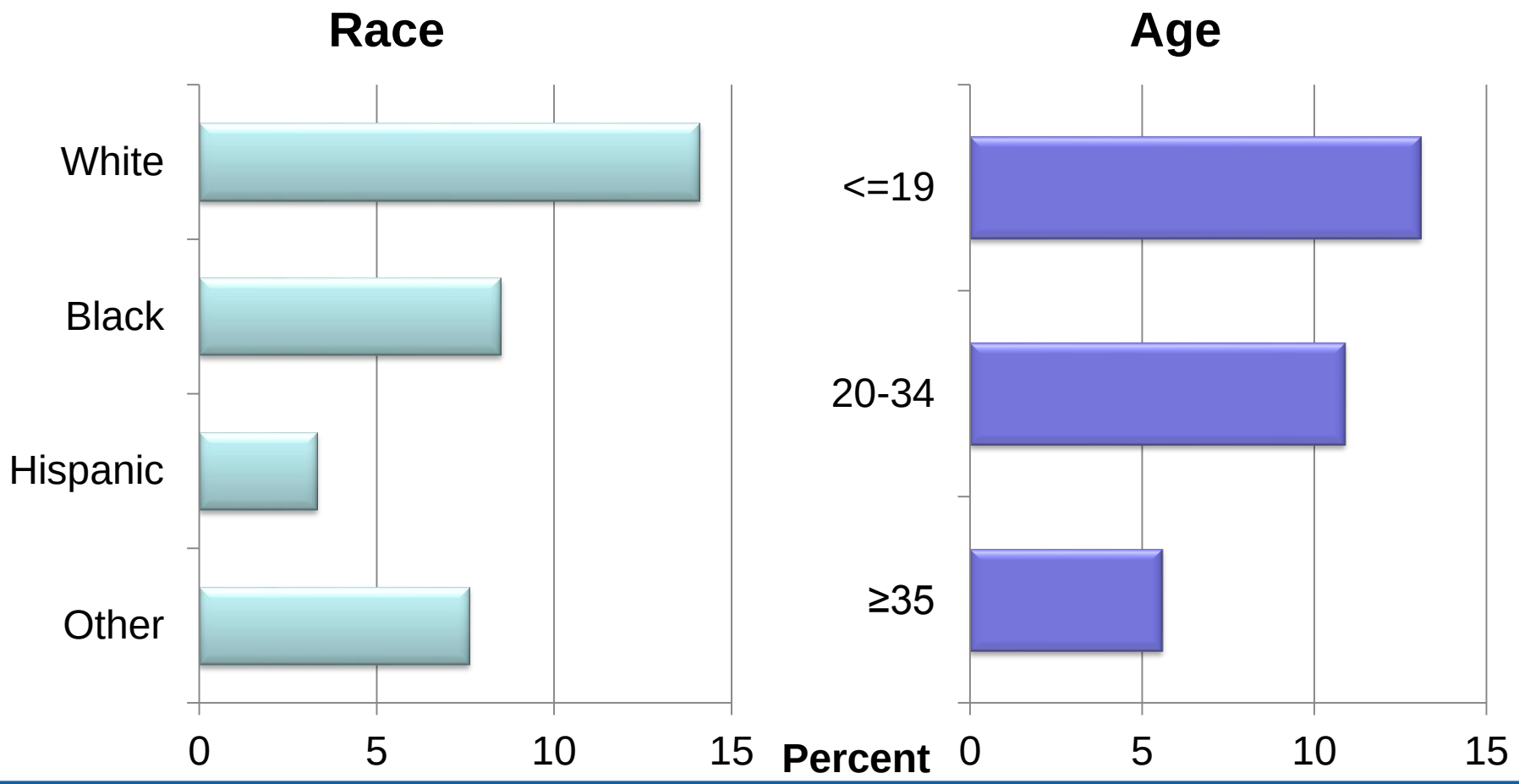
- Breastfeeding
- Cigarette smoking during pregnancy
- Contraceptive use
- HIV counseling and testing
- Infant Sleep Position
- Influenza vaccination
- Medicaid and WIC participation
- Multivitamin use
- Physical abuse
- Preconception health
- Prenatal care
- Unintended pregnancy

Smoking During Pregnancy, 26 PRAMS Sites



Pregnancy Risk Assessment Monitoring System, 2010

Smoking During Pregnancy, by Race and Age



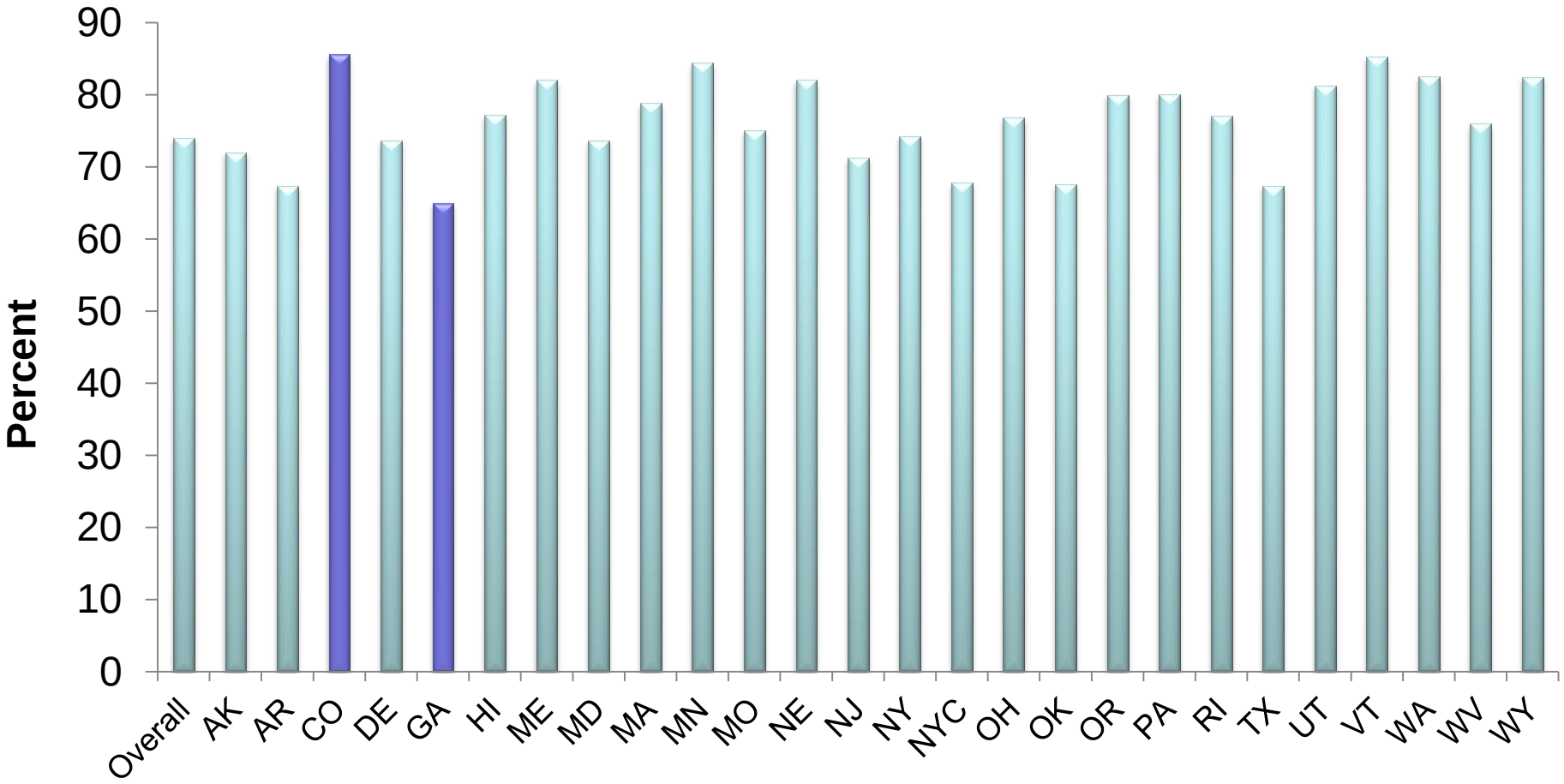
Pregnancy Risk Assessment Monitoring System, 2010

Behind the Numbers

“I smoked a lot while pregnant with my daughter. As a result, she was born 6 weeks premature and weighed 3 lbs 6 oz. She stayed in the hospital for a month. People really don’t think smoking effects pregnancy, but it does (in) so many ways. I wish there was a way to stress to people the importance of NOT SMOKING!!”

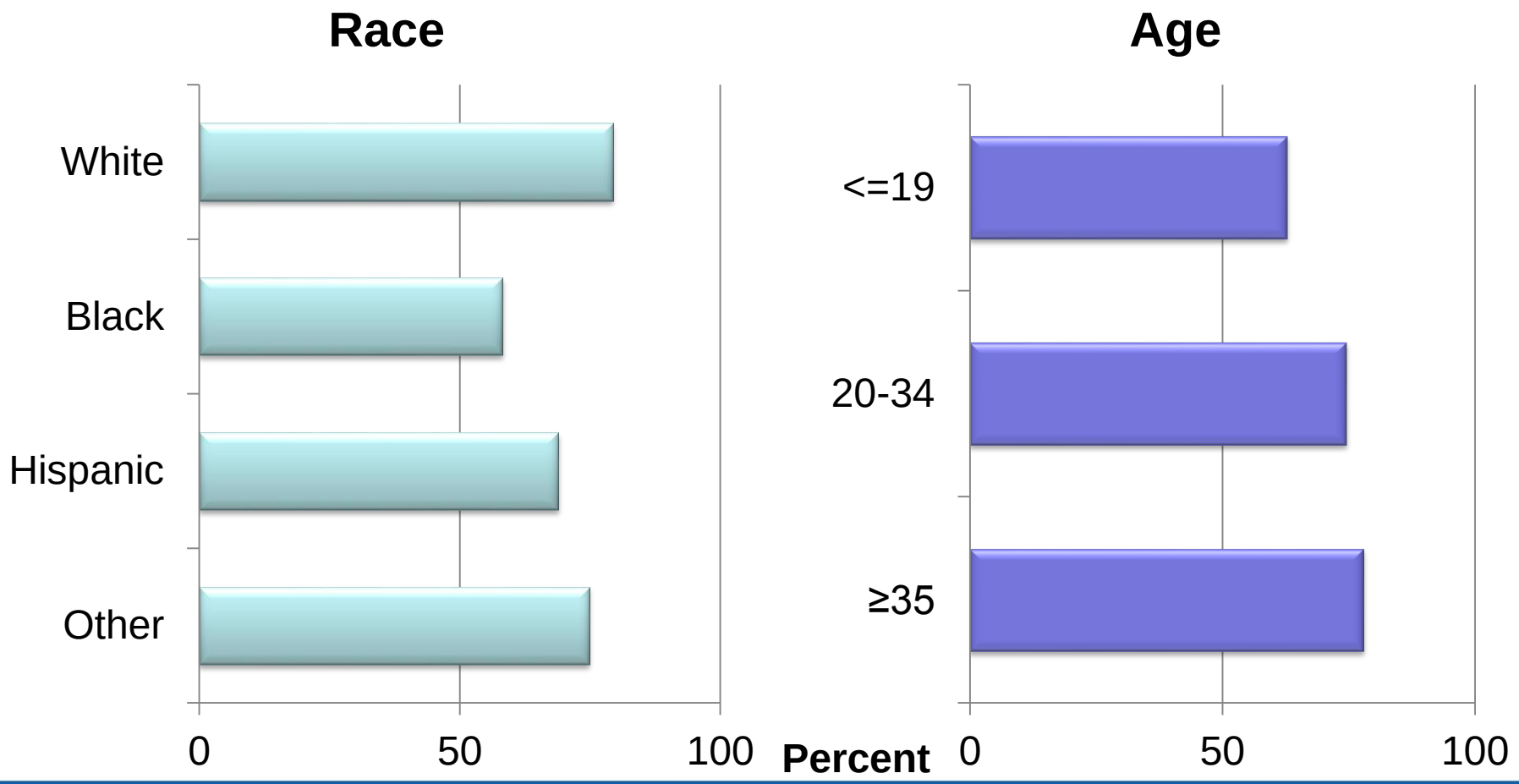
» *PRAMS respondent*

Infants Placed to Sleep on Back



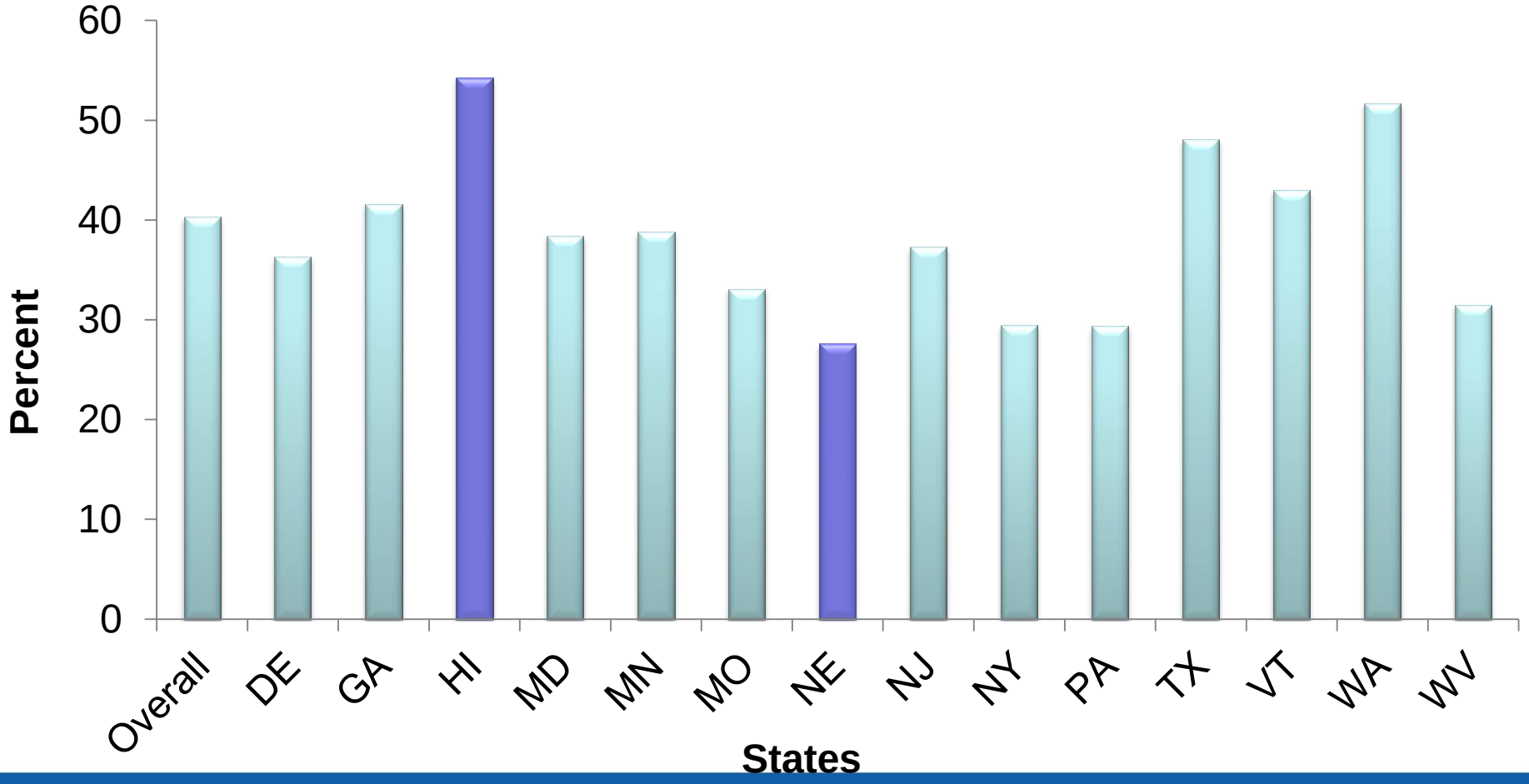
Pregnancy Risk Assessment Monitoring System, 2010

Back Sleep Position, by Race and Age



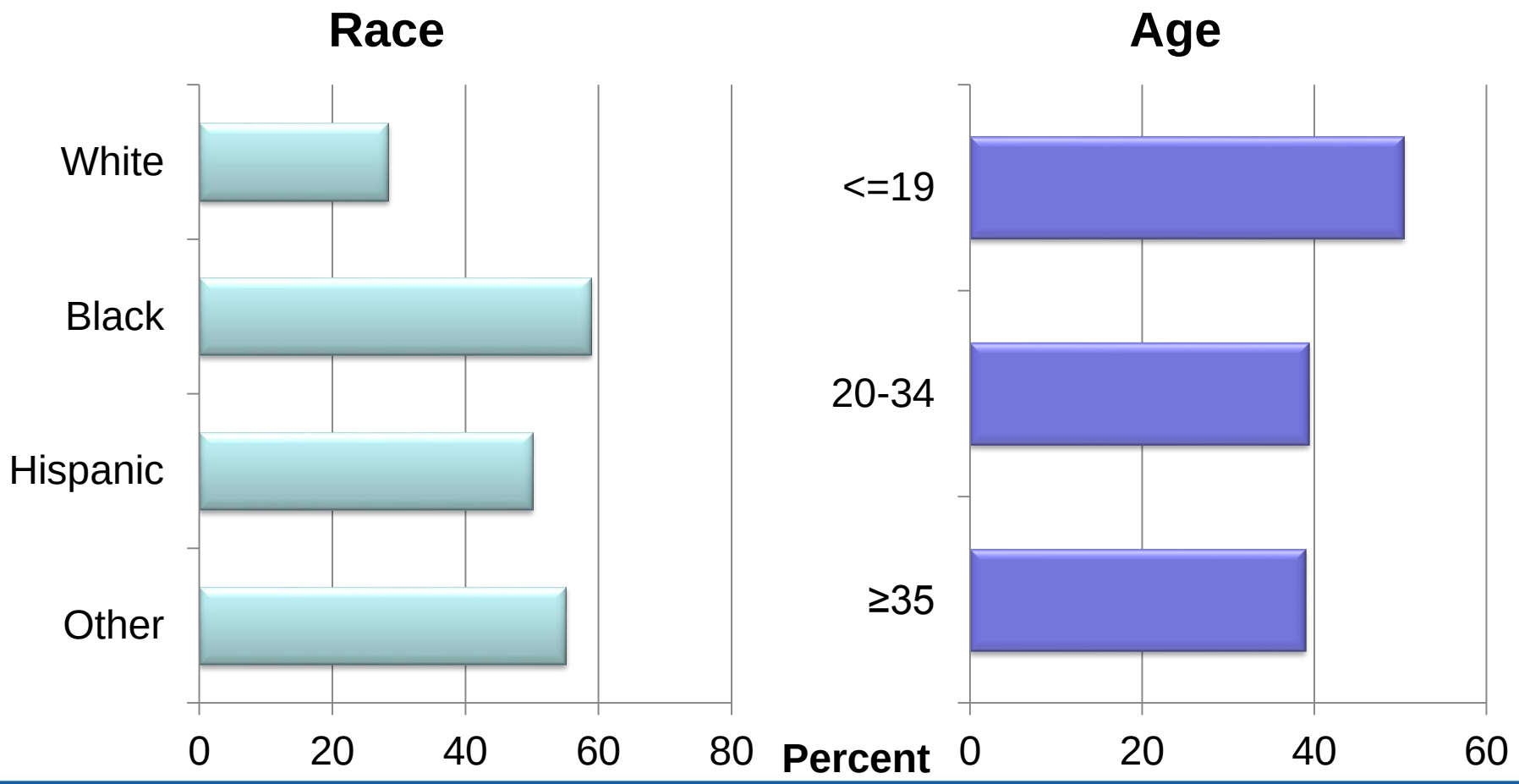
Pregnancy Risk Assessment Monitoring System, 2010

Infant Bed Sharing at 14 Sites



Pregnancy Risk Assessment Monitoring System, 2010

Infant Bed Sharing, by Race and Age



Pregnancy Risk Assessment Monitoring System, 2010

Impact of PRAMS Data on Smoking in West Virginia

- **"Tobacco Free Pregnancy Initiative" launched in 2009**
- **Initiative officially introduced by governor**
  - Community grants available for tobacco cessation services
  - "Tobacco Free for Baby and Me" program (Women's and Children's Hospital)
  - "Day One" program offered at delivery hospitals (Healthcare Education Foundation)
  - Free tobacco cessation counseling training for healthcare providers (Marshall University School of Medicine)

Preliminary Data on WV Tobacco Free Pregnancy Initiative Campaign Effectiveness

- **In the first 6 weeks of the media campaign:**
  - 2,355 calls were made to the Quitline
  - 500 callers enrolled in a tobacco cessation program
    - 48% of these enrollees had seen media materials from the Tobacco Free Pregnancy Initiative
    - 20% of these callers were pregnant women and their families

Impact of PRAMS on Safe Sleep in Michigan

- **From PRAMS data:**
  - Back to sleep position 20% lower among blacks
  - Younger, less educated women more likely to bed share
- **In 2004, Tomorrow's Child and the Michigan Department of Health launched the Infant Safe Sleep Campaign**
  - Endorsed by the governor

MICHIGAN PRAMS

MI Infant Safe Sleep Campaign: Recommendations and Policy Actions

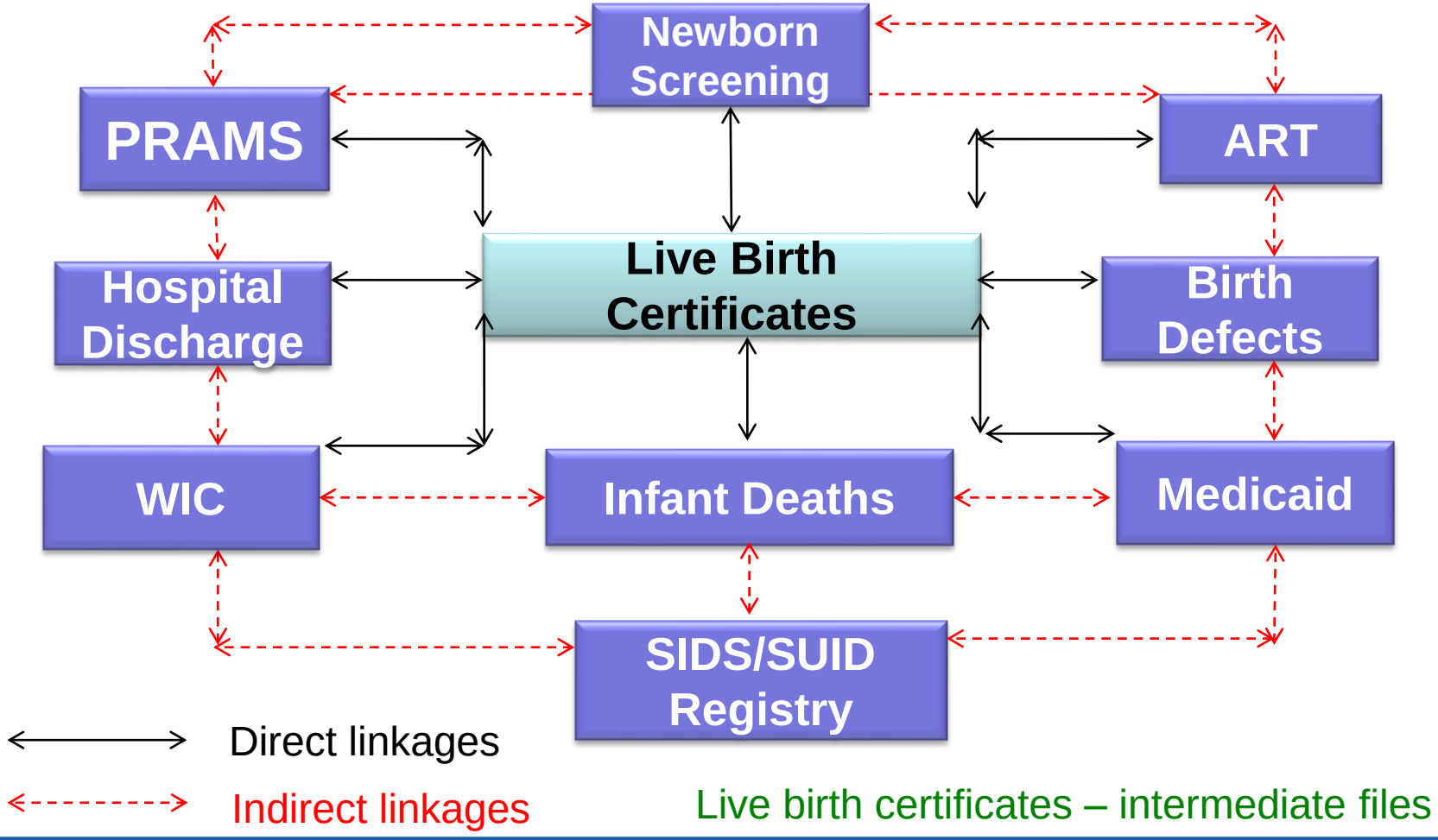
- Developed unified infant safe sleep recommendations
- Integrated Infant Safe Sleep message into existing programs and services of the state health department
- Set standards of care, policies, and procedures for hospitals, health plans, and state agencies
- Required adherence to Safe Sleep recommendations as a condition of licensure for child care centers
- Distributed consumer materials with consistent Safe Sleep messages

MICHIGAN PRAMS

www.michigan.gov/documents/Safe_Sleep_Report_Final_123380_7.pdf

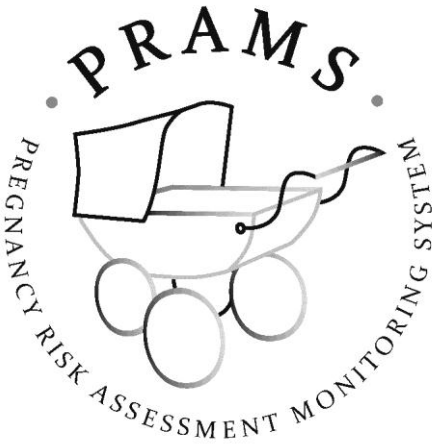
www.michigan.gov/dhs/0,4562,7-124-5453_7124_57836---,00.html

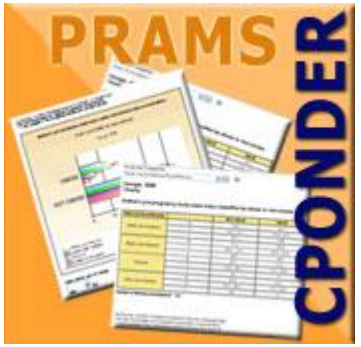
Data Linkages



ART: Assisted Reproductive Technology
WIC: Special Supplemental Nutrition Program for Women, Infants and Children
Grigorescu V, Kleyn MJ, Korzeniewski SJ et al. Am J Prev Med 2010;38(4S):S522–S527

PRAMS Information





www.cdc.gov/prams/

www.cdc.gov/prams/cponder.htm

CPONDER: CDC PRAMS Online Data for Epidemiologic Research

Preventing Sudden and Unexpected Infant Death: From “Back to Sleep” to “Safe to Sleep”

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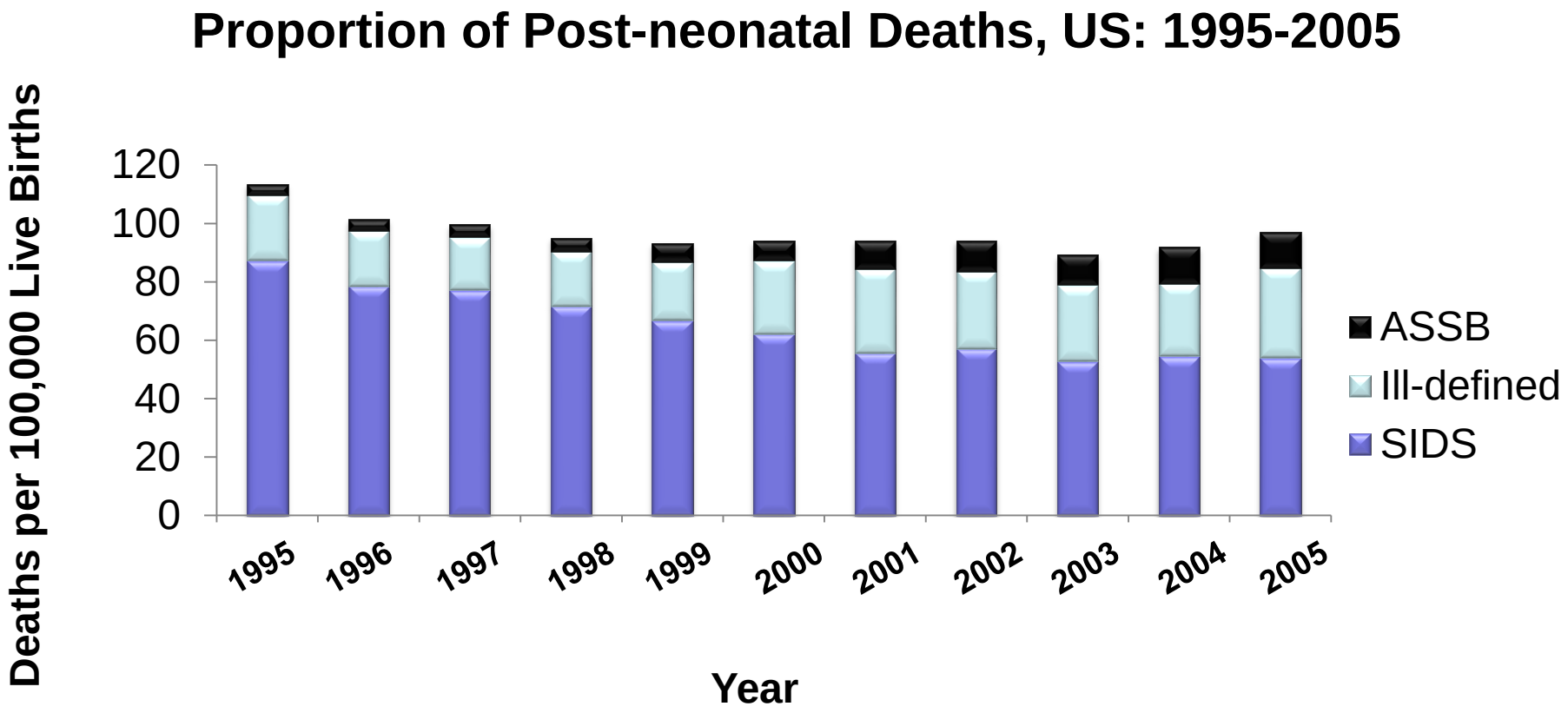
American Academy of Pediatrics

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

Scope of the Problem

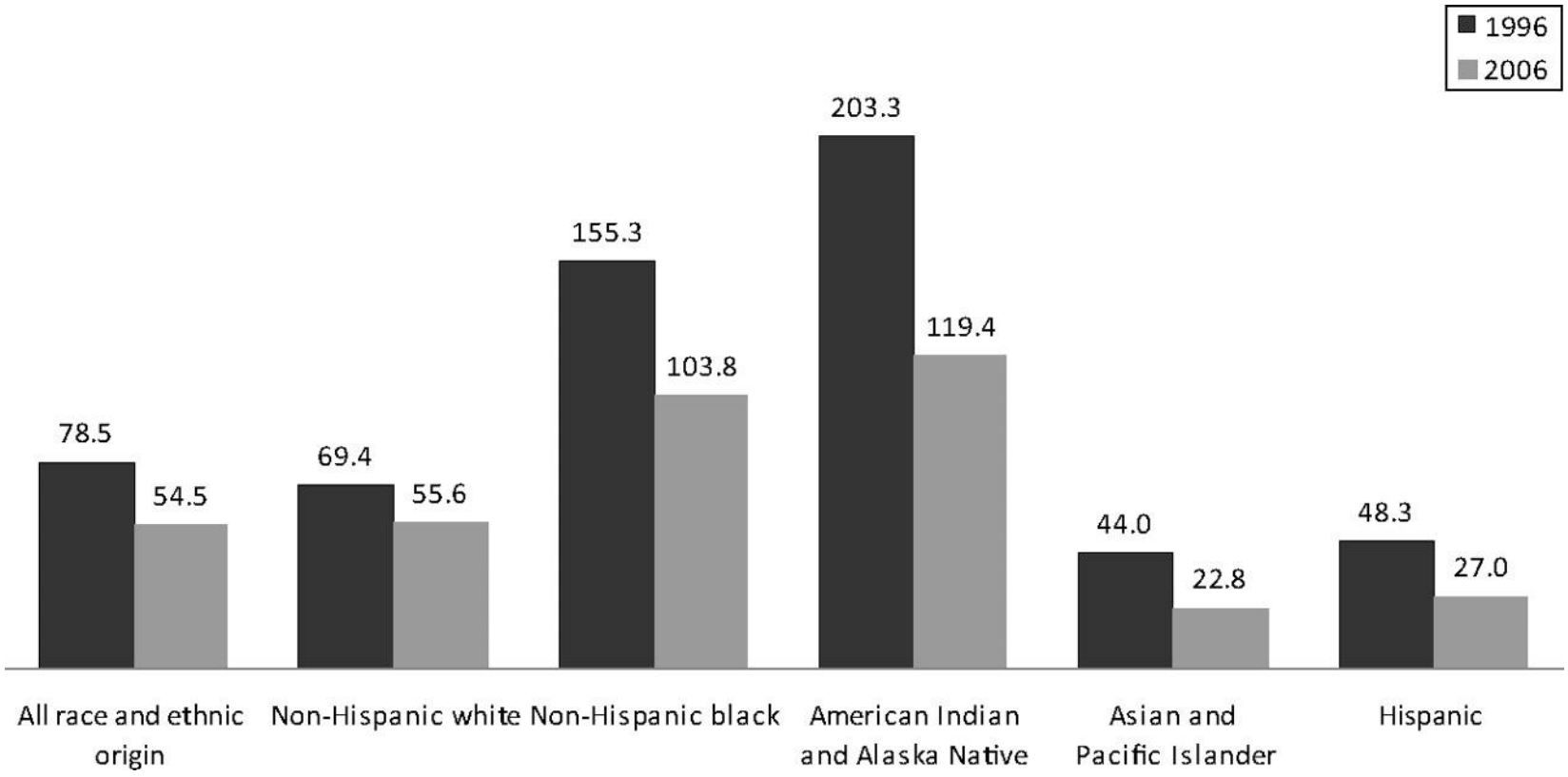
- **Sudden and unexpected infant death (SUID)**
  - Also called sudden and unexpected death in infancy (SUDI)
  - Accounts for ~4500 U.S. deaths annually
- **Most occur during sleep (sleep-related deaths)**
  - Accidental suffocation and strangulation in bed (ASSB)
  - Ill-defined
  - Sudden infant death syndrome (SIDS)
- **SIDS comprises one-half of SUID deaths**
  - No cause found after autopsy, death scene investigation, review of clinical history
  - Leading cause of postneonatal mortality (1 month - 1 year)

Rates of SIDS and SUID



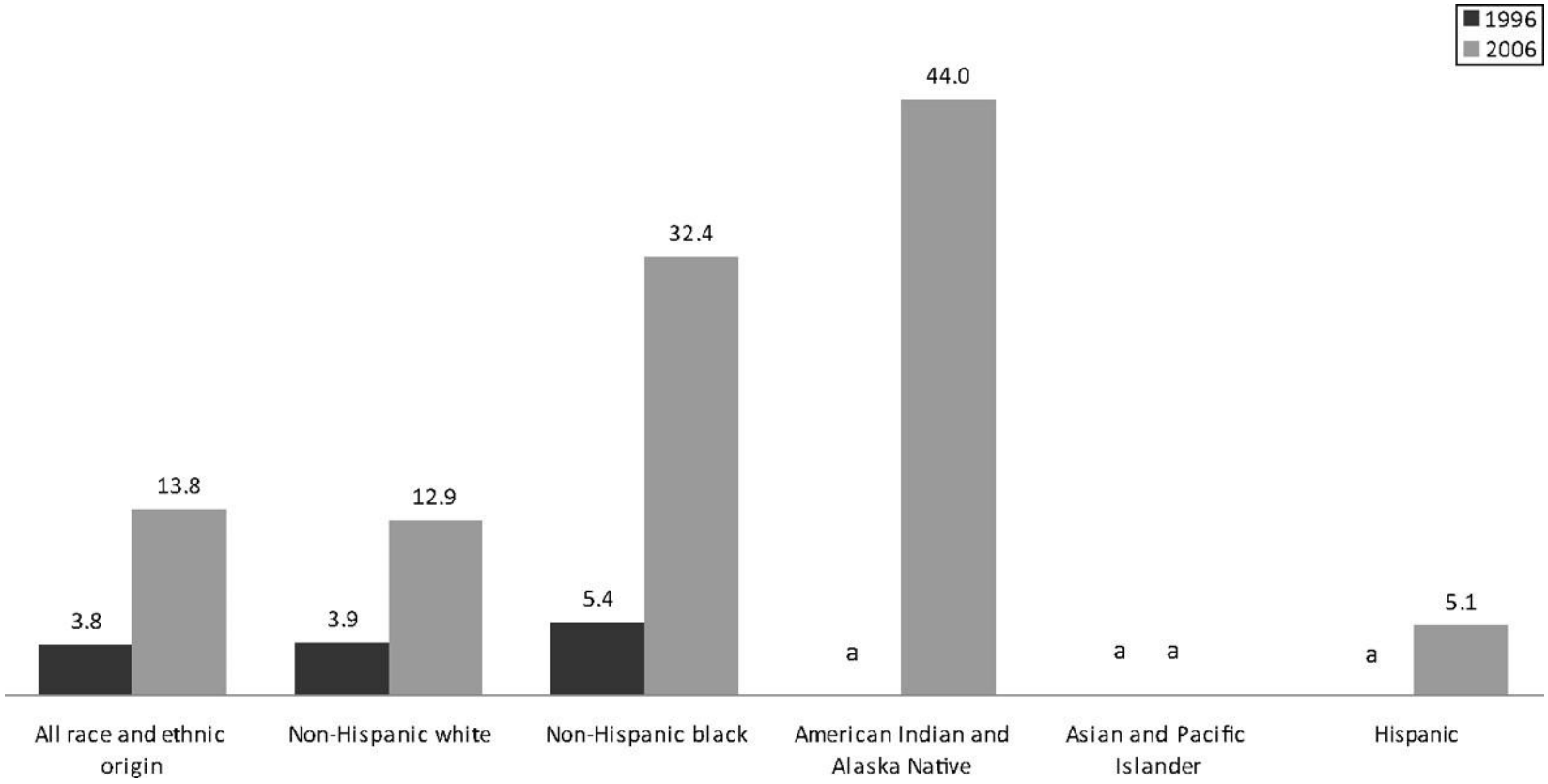
CDC Wonder, 2011

Comparison of U.S. Rates of SIDS by Maternal Race and Ethnic Origin, 1996 and 2006



Pediatrics. 2011;128

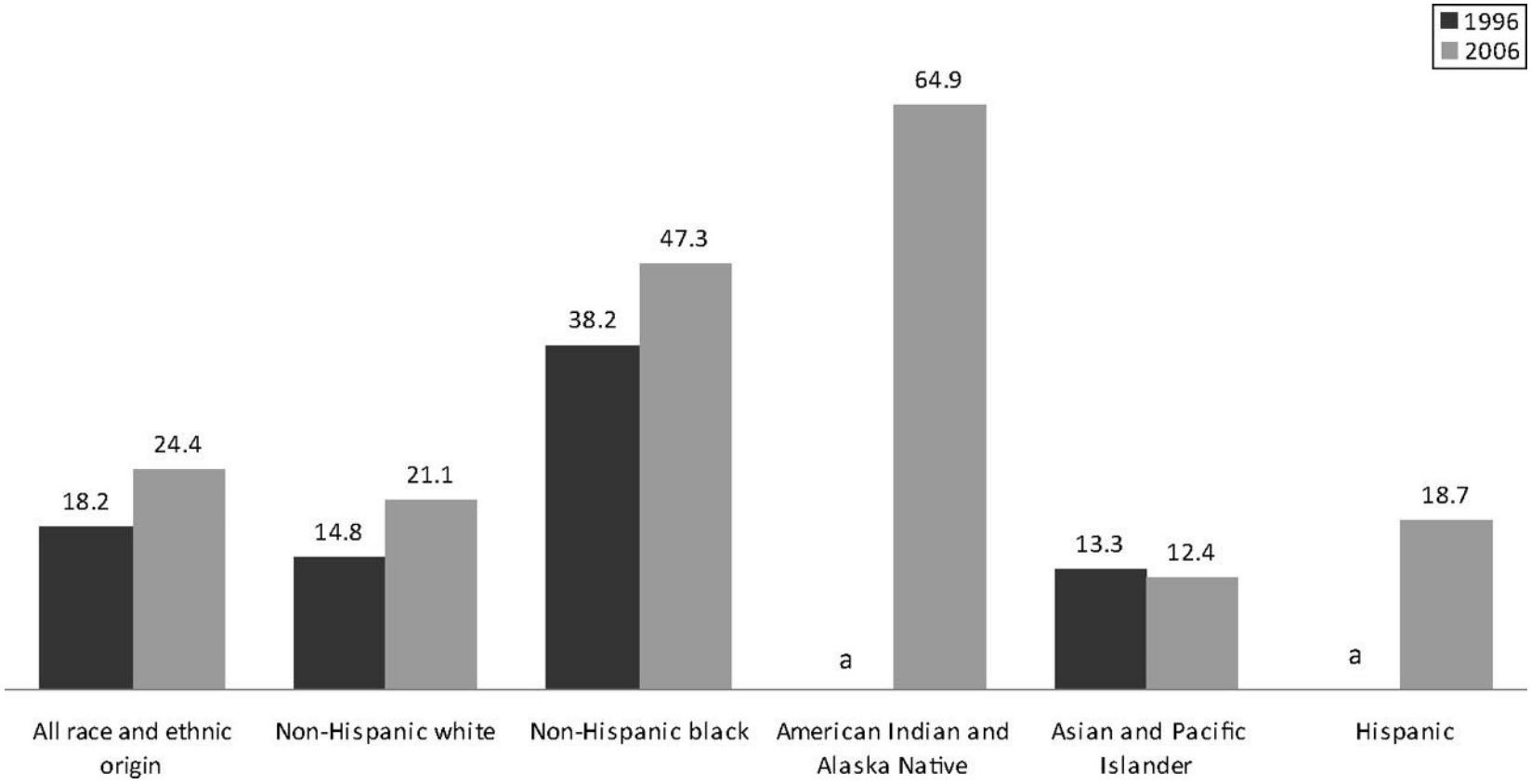
Comparison of U.S. Rates of ASSB Deaths by Maternal Race and Ethnic Origin, 1996 and 2006



Pediatrics. 2011;128
ASSB: accidental strangulation and suffocation in bed

a The figure does not meet standards of reliability or precision on the basis of fewer than 20 deaths in the numerator

Comparison of U.S. Rates of Cause Ill-Defined or Unspecified Death by Maternal Race and Ethnic Origin, 1996 and 2006



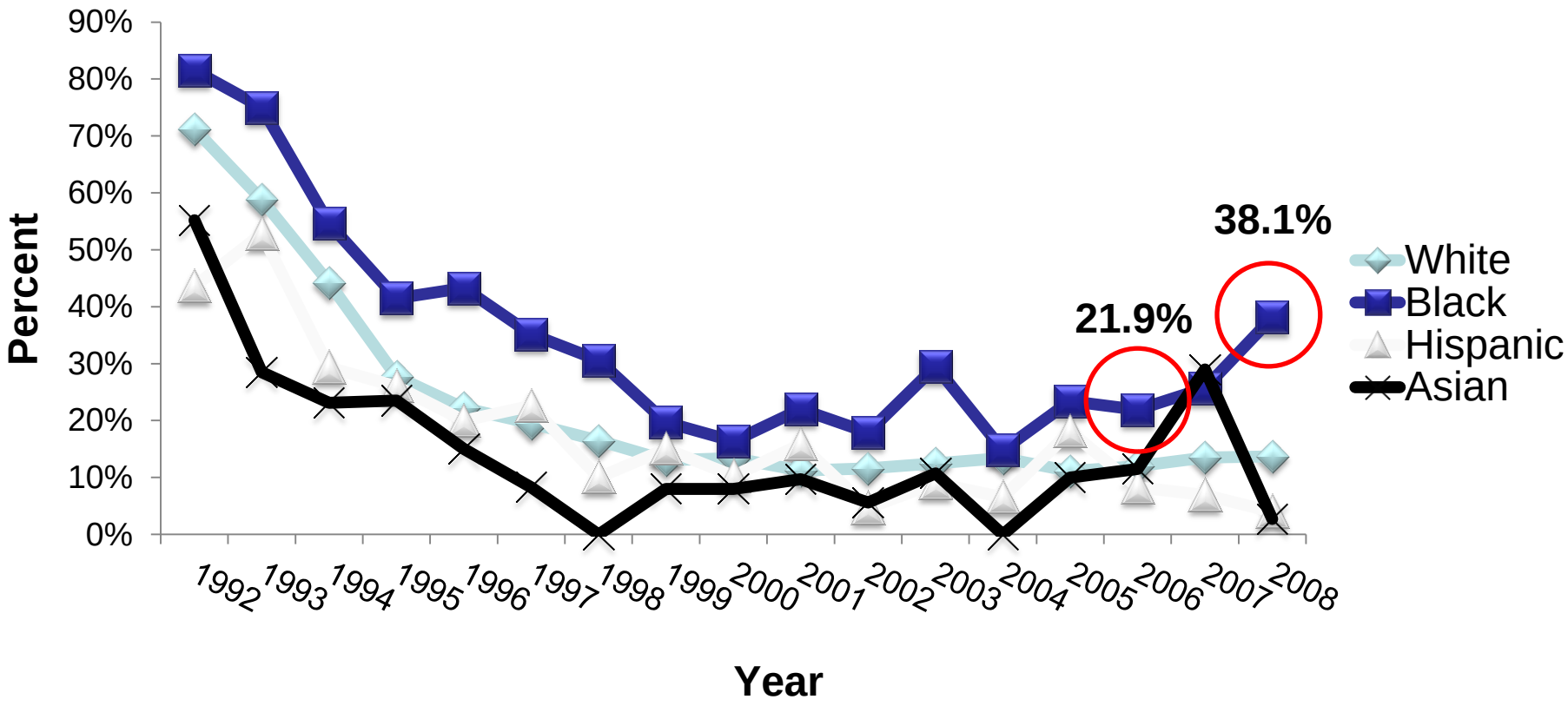
Pediatrics. 2011;128

a The figure does not meet standards of reliability or precision on the basis of fewer than 20 deaths in the numerator

Possible Explanations for Racial Disparities in Sleep-Related Infant Deaths

- **Biological differences**
  - Example: nicotine metabolism
- **Behavioral differences**
  - Sleep position
  - Bedsharing
  - Use of soft bedding
  - Breastfeeding
  - Smoke exposure

Prone Sleep Prevalence, by Race and Ethnicity



National Infant Sleep Position Survey, 2008

Established Risk Factors for Sleep-Related Deaths

- **Side or prone position (OR 2.3-13.1)**
- **Bedsharing (OR 2.88): risk increases with**
  - Smoker parent (OR 2.3-17.7)
  - Infant <3 months (OR 4.7-10.4), regardless of parental smoking status
  - Soft surfaces e.g. couches, armchairs (OR 5.1-66.9)
  - Soft bedding (OR 2.8-4.1)
  - Multiple bedsharers (OR 5.4)
  - Parent consumed alcohol, drugs, or is overtired (OR 1.66)
- **Soft bedding (OR 5.0; + prone = 21.0)**
- **Smoke exposure (prenatal + postnatal)**
- **Prenatal drug and alcohol use (OR varies, >3.0)**

OR: odds ratio

Protective Factors for Sleep-Related Deaths

- Roomsharing without bedsharing (OR 0.5)
- Breastfeeding: ever (OR 0.4), any exclusive (OR 0.27)
- Pacifier use (OR 0.39)
- Immunizations (OR 0.5)

OR: odds ratio

Level A AAP Recommendations for Reducing the Risk of SIDS

- **Based on good and consistent scientific evidence**
  - Back to sleep for every sleep
  - Use a firm sleep surface
  - Room-sharing without bed-sharing is recommended
  - Keep soft objects and loose bedding out of the crib
  - Pregnant women should receive regular prenatal care
  - Avoid smoke exposure during pregnancy and after birth
  - Avoid alcohol and illicit drug use during pregnancy and after birth
  - Breastfeeding is recommended

Pediatrics. 2011; 128(5)

Level A AAP Recommendations for Reducing the Risk of SIDS (continued)

- **Based on good and consistent scientific evidence**
  - Consider offering a pacifier at nap time and bedtime
  - Avoid overheating
  - Do not use home cardiorespiratory monitors as a strategy for reducing the risk of SIDS
  - Expand the national campaign to reduce the risks of SIDS to include a major focus on the safe sleep environment and ways to reduce the risks of all sleep-related infant deaths, including SIDS, suffocation, and other accidental deaths; pediatricians, family physicians, and other primary care providers should actively participate in this campaign

Pediatrics. 2011; 128(5)

Level B AAP Recommendations for Reducing the Risk of SIDS

- **Based on limited or inconsistent scientific evidence**
  - Infants should be immunized in accordance with recommendations of the AAP and Centers for Disease Control and Prevention
  - Avoid commercial devices marketed to reduce the risk of SIDS
  - Supervised, awake tummy time is recommended to facilitate development and to minimize development of positional plagiocephaly

Pediatrics. 2011; 128(5)

Level C AAP Recommendations for Reducing the Risk of SIDS

- **Based primarily on consensus and expert opinion**
  - Health care professionals, staff in newborn nurseries and NICUs, and child care providers should endorse the SIDS risk-reduction recommendations from birth
  - Media and manufacturers should follow safe-sleep guidelines in their messaging and advertising
  - Continue research and surveillance on the risk factors, causes, and pathophysiological mechanisms of SIDS and other sleep-related infant deaths, with the ultimate goal of eliminating these deaths entirely

Pediatrics. 2011; 128(5)

Relevant National Initiatives

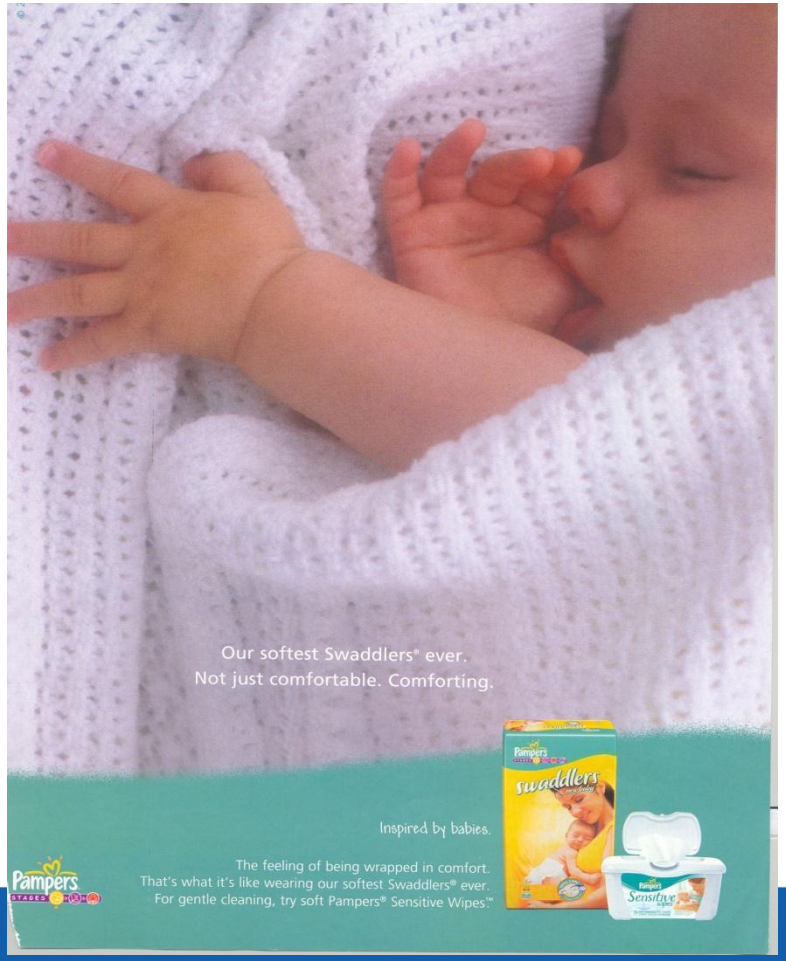
- **Cribs for Kids**
  - >300 partners nationally
  - Provide low-cost portable cribs to organizations, who then provide them free or at cost to parents who cannot afford a crib
- **ABCs**
  - Alone, on your Back, in a Crib
  - Baltimore City Health Department and others
- **Safe to Sleep**
  - NICHD-led public awareness campaign
  - Expands focus from back sleeping only to ALL of the components of a safe sleep environment (position, bedding, bedsharing, sleep surface, etc.)

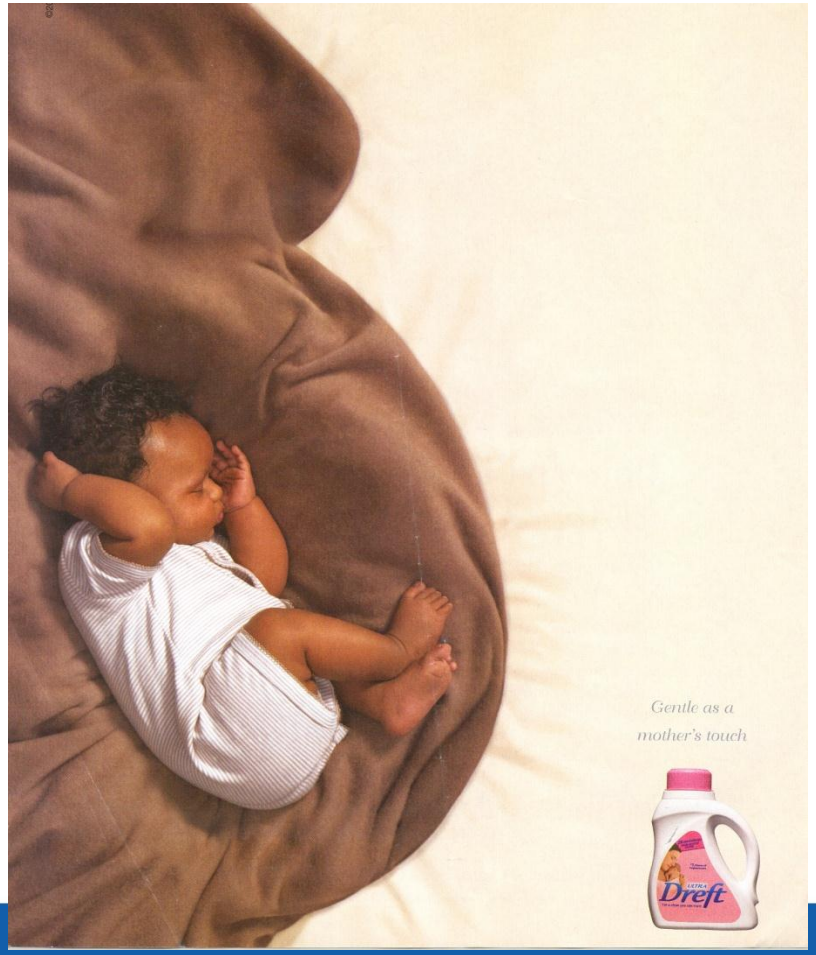
NICHD: National Institute for Child Health and Development

Role of Health Professionals

- **Patient and community education**
  - Need to understand what the barriers are (misconceptions, financial barriers, etc.)
  - Need to increase parental self-efficacy
  - Need to explain how recommendations work
- **Modeling of safe sleep behaviors**
  - Doctors and nurses
  - “Do as I say, not as I do”
- **Monitoring of media**

Portrayals of Unsafe Sleep Practices





Toward A National Strategy on Infant Mortality

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Maternal and Child Health Bureau

Health Resources and Services Administration

U.S. Department of Health and Human Services HRSA Health Resources and Services Administration

U.S. Department of Health and Human Services Centers for Disease Control and Prevention

Call to Action

And where infant mortality has taken the highest toll in the US, we're also partnering with state officials to create strategies and interventions to begin bringing these rates down. Our plan is to find out what works and scale up the best interventions to the national level.

And today I'm pleased to announce my department will be collaborating in the next year to create our nation's first ever national strategy to address infant mortality.

Secretary Kathleen Sebelius

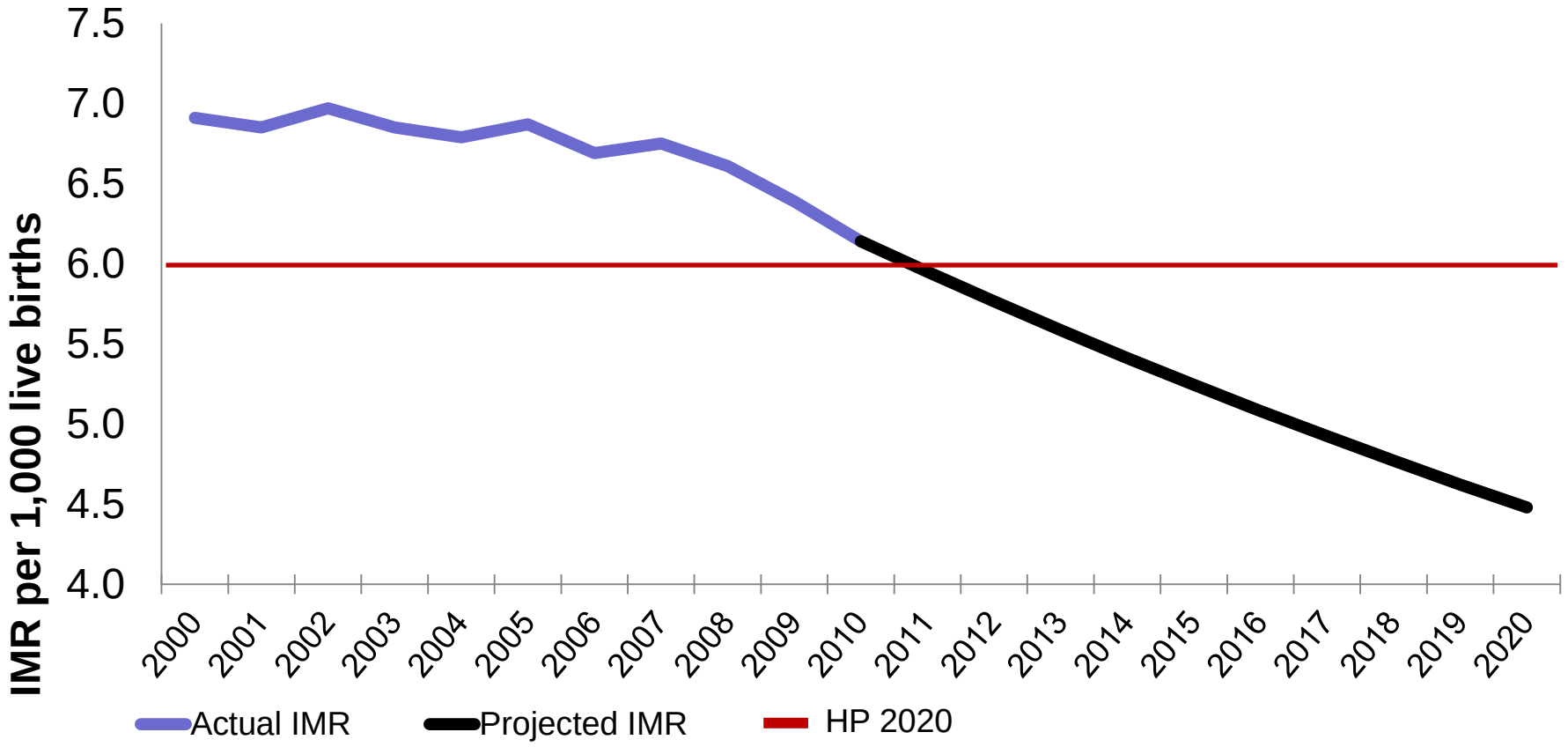
Child Survival: Call to Action

June 14, 2012

Major National Initiatives to Reduce Infant Mortality

Lead Organization	Initiative
American Congress of Obstetricians and Gynecologists	reVITALize Conference
Association of Maternal and Child Health Programs	Forging a Comprehensive Initiative to Improve Birth Outcomes and Reduce Infant Mortality
Association of State and Territorial Health Officials	ASTHO Presidential Challenge and Healthy Babies Initiative
Association of Women's Health, Obstetric and Neonatal Nurses	Go for the Full Forty Initiative
Centers for Disease Control and Prevention	Preconception Care Workgroup and Select Panel on Preconception Care
Centers for Medicaid and Medicare Innovation	Strong Start Initiative
Centers for Medicaid and Medicare Services	CMCS Expert Panel on Improving Maternal and Infant Outcomes
Health Resources and Services Administration	Collaborative Improvement and Innovation Network to Reduce Infant Mortality
March of Dimes	Healthy Babies are Worth the Wait Initiative
National Priorities Partnership- National Quality Forum	Maternity Action Team

Infant Mortality Rate in the US



IMR: infant mortality rate
HP: Healthy People

Secretary's Advisory Committee on Infant Mortality (SACIM): Charge and Purpose

- Advises the Secretary on DHHS activities and programs that are directed at reducing infant mortality and improving the health status of pregnant women and infants
- Provides guidance and attention on the policies and resources required to reduce infant mortality
- Provides advice on how to coordinate the variety of federal, state, local and private programs and efforts that are designed to deal with the health and social problems impacting on infant mortality

DHHS: Department of Health and Human Services

SACIM
Priorities for National Strategy on Infant Mortality

- Improve women's health before pregnancy
- Promote quality and safety along the continuum of perinatal healthcare
- Invest in prevention and health promotion
- Promote service coordination and systems integration
- Strengthen surveillance and support research
- Promote interagency, public-private, and multi-disciplinary collaboration

Preconception Health and Healthcare

- CDC/ATSDR Preconception Care Work Group and Select Panel on Preconception Care
- Office of Minority Health Preconception Peer Educators
- CMS Expert Panel on Interconception Care
- Affordable Care Act
  - Clinical preventive services coverage for women outside of pregnancy, without co-pays (effective August 2012)
- Recognition that prenatal care is necessary but not sufficient for improved pregnancy outcomes

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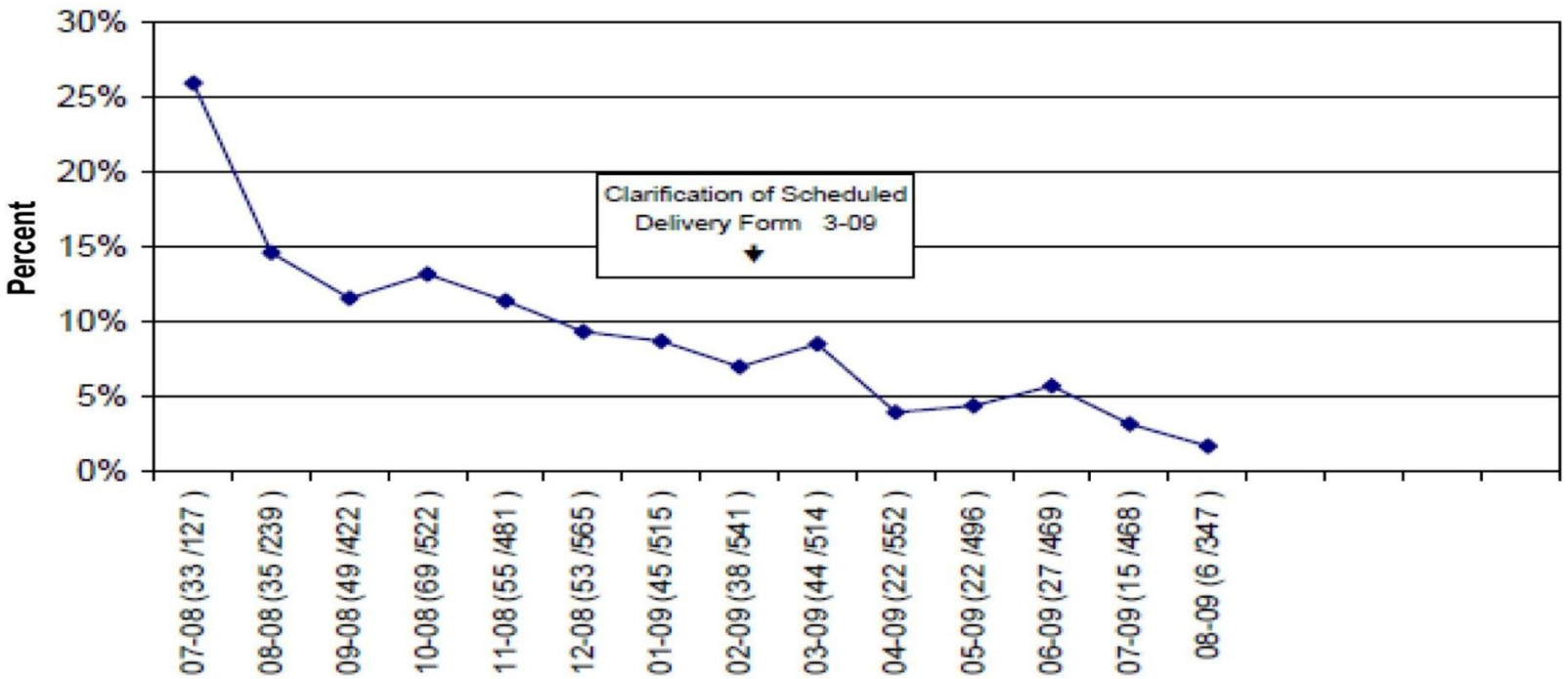
Opportunities for Quality Improvement

- **Reduce elective delivery < 39 weeks**
  - ASTHO/March of Dimes
  - CMMI
  - HRSA
  - National Governors' Association
  - National Priorities Partnership
- **Promote appropriate use of 17 Alpha-hydroxyprogesterone (17P) to prevent premature deliveries**
- **Improve screening for asymptomatic bacteriuria and GBS**
- **Reduce central-line associated bloodstream infections in newborns**

GBS: Group B Streptococcus
CMMI: Center for Medicare and Medicaid Innovation

Ohio Perinatal Quality Collaborative: Real Decrease in Elective Late Preterm Deliveries



The denominator is the number of scheduled deliveries 36 to 38 weeks gestation (number of scheduled delivery forms submitted). The numerator is the number of scheduled deliveries without indication documented.

Donovan EF, Lannon C, Bailit J et al. A statewide initiative to reduce inappropriate scheduled births at 36(0/7)-38(6/7) weeks' gestation. Am J Obstet Gynecol. 2010 Mar;202(3):243.e1-8.

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Opportunities for Prevention and Promotion

- **Missed opportunities**
  - Smoking cessation
  - Safe Sleep
  - Breastfeeding
  - Immunization
  - Family planning
- **New Workforce**
  - Health educator
  - Home visiting nurse
  - Community health worker or doula
- **New Platform**
  - Group prenatal care
- **New Technologies**
  - Social media

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Strengthen Systems Integration

- **Vertical integration**
  - Appropriate levels of care
- **Horizontal integration**
  - Service coordination and systems navigation
- **Longitudinal integration**
  - Care continuum across the life course
- **Examples**
  - Perinatal Regionalization; making sure that high-risk babies are born where they can be best cared for medically
  - Maternal, Infant, and Early Childhood Home Visiting Program
  - Maternity Medical Home, Birthing Centers
  - Navigator, community accountable care systems

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Surveillance and Research

- **Strengthen surveillance**
  - Standardize vital records
  - Improve data linkage capacity
  - Promote quality improvement using real-time data
- **Support translational disparities research**
  - T1 to T2 (basic science to clinic)
  - T2 to T3 (clinic to community)
  - T3 to T4 (community to policy)

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Collaborative Improvement and Innovation Network (COIN) to Reduce Infant Mortality

- Partnership established among HRSA, ASTHO, AMCHP, CDC, CityMatCH, CMS, March of Dimes, NGA, NPP, and the states
- Began in the 13 southern states in January 2012
- States developed their own state plans to reduce infant mortality

Gloor, PA. Swarm Creativity: Competitive Advantage through Collaborative Innovation Networks, 2006

COIN: Strategies and Structure

5 Strategy Teams

- Reducing elective deliveries <39 weeks
- Expanding interconception care in Medicaid
- Reducing SIDS/SUID
- Increasing smoking cessation among pregnant women
- Enhancing perinatal regionalization

Teams

- 2 - 3 Leads (Content Experts)
- Method experts
- Data experts
- Shared workspace
- Data dashboard

COIN: Collaborative Improvement and Innovation Network

Regions IV and VI Infant Mortality COIN Aims

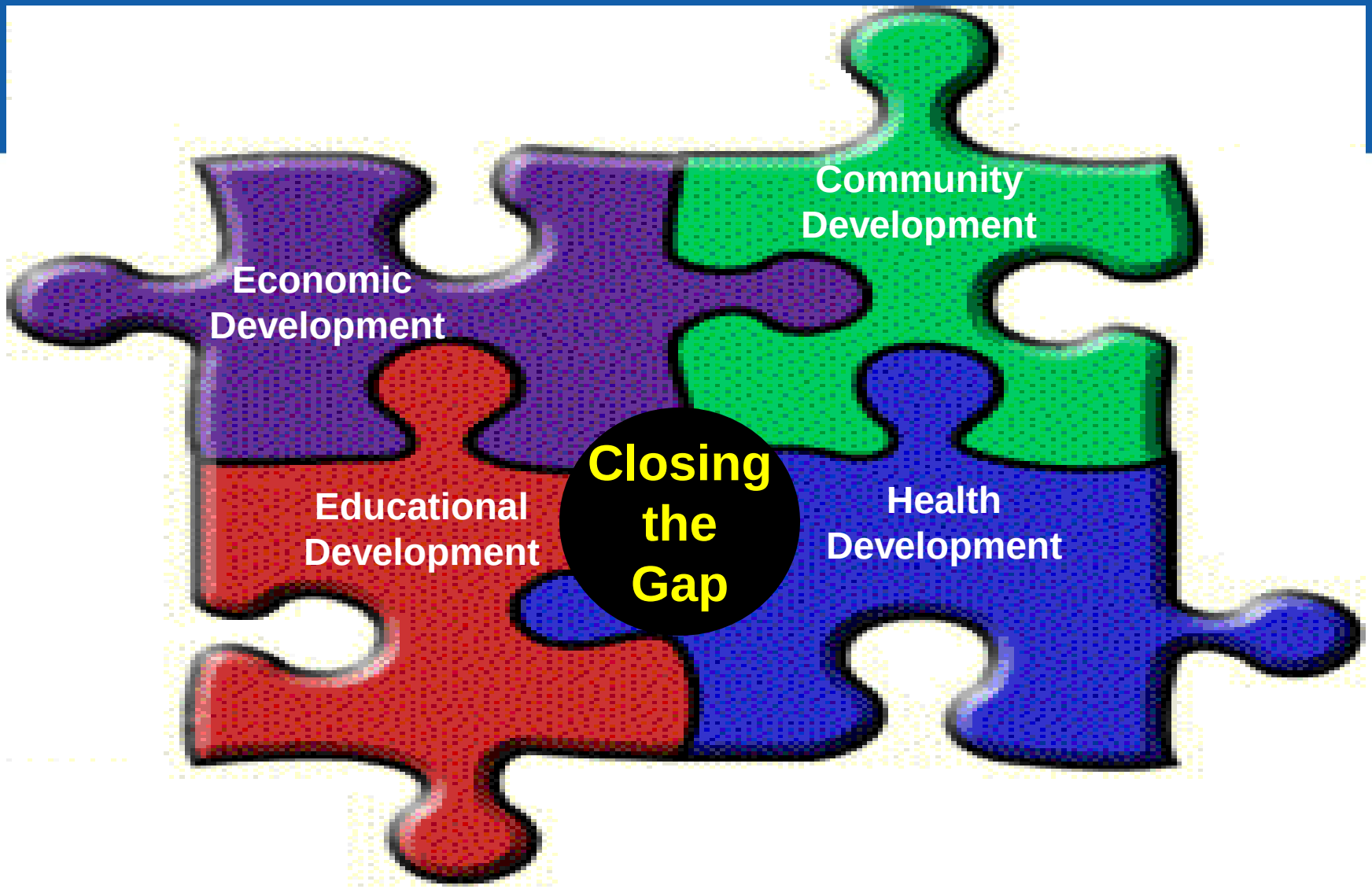
- **By December 2013:**
  - Reduce elective delivery < 39 weeks by 33%
  - Reduce smoking rate among pregnant women by 3%
  - Increase safe sleep practices by 5%
  - Increase mothers delivering at appropriate facilities by 20%
  - Change Medicaid policy and procedures around interconception care in at least 5 - 8 states

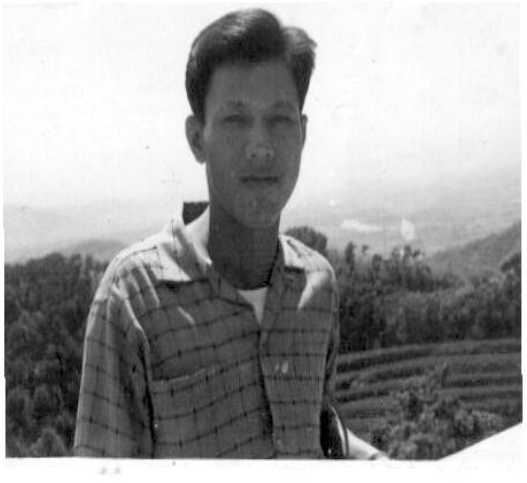
COIN: Collaborative Improvement and Innovation Network

Health Equity

- **Overarching goal of the national strategy**
  - Need aspirational goal for the infant mortality gap
- **Life-Course Perspective as a Guiding Framework**
  - Place-based initiatives working across multiple sectors
  - Policy changes (e.g. inclusion of anti-poverty programs such as TANF reauthorization as part of the national strategy to address infant mortality)

TANF: Temporary Assistance to Needy Families


Community Development
Economic Development
Closing the Gap
Educational Development
Health Development



Public Health Approaches to Reducing U.S. Infant Mortality

- **Infant Mortality in the US: Where We Stand**

  Wanda Barfield, MD, MPH, FAAP, Captain, U.S. Public Health Service,
  Director, Division of Reproductive Health,
  Centers for Disease Control and Prevention

- **PRAMS: Using Data to Reduce Infant Deaths**

  Denise D'Angelo, MPH, Health Scientist, Division of Reproductive Health,
  Applied Sciences Branch, PRAMS Team
  Centers for Disease Control and Prevention

- **Preventing Sudden and Unexpected Infant Death: From "Back to Sleep" to "Safe to Sleep"**

  Rachel Moon, MD, FAAP, American Academy of Pediatrics

- **Toward a National Strategy on Infant Mortality**

  Michael C. Lu, MD, MS, MPH, Associate Administrator,
  Maternal and Child Health, Health Resources and Services Administration